

Economic Data Collection Program

Mothership Report (2009-2016)

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National Marine Fisheries Service

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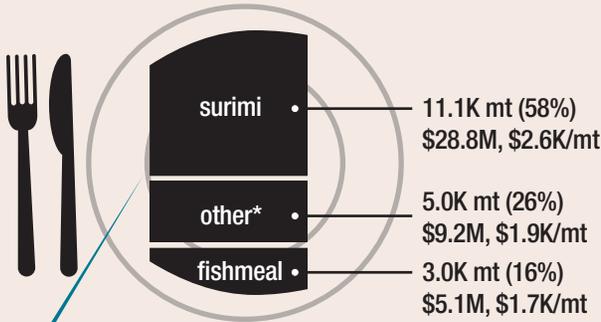
May 17, 2019

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2016 Economic Data Collection (EDC)
West Coast Groundfish Trawl
Catch Share Program

MOTHERSHIP

PACIFIC WHITING FLEET-WIDE PRODUCTION SUMMARY



All products:
19.0K mt
\$43.1M, \$2.3K/mt

*other includes: minced, fillets, fish oil, headed and gutted, and round, combined for confidentiality.



product recovery rate

ECONOMIC SUMMARY*

Vessel Average

\$7.2M revenue
\$5.1M variable costs
\$2.1M variable cost net revenue
\$1.1M fixed costs
\$1.0M total cost net revenue

\$24.7K variable cost net revenue per day

Fleet-wide Totals

6 vessels
\$43.1M revenue
\$12.3M variable cost net revenue
\$5.8M total cost net revenue

ALASKA & WEST COAST PARTICIPATION

Number of vessels operating in Alaska: 6
Total fleet-wide trips to Alaska: 25
Total purchases in Alaska: 198K mt



WC DELIVERY PORTS

of vessels offloading in each port

Bellingham (3) [icon]

Seattle (2) [icon]
(All motherships reported Seattle as their home port.)

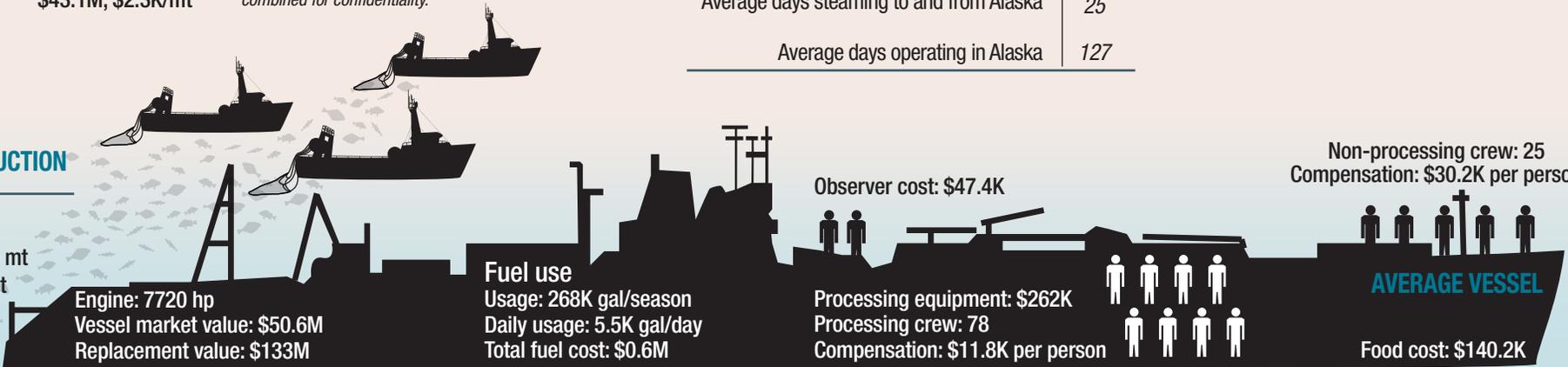
Annual production per vessel: 3.2K mt

FISHERY PARTICIPATION

	Days at Sea
Average days processing and steaming on the West Coast	66
Average days steaming to and from Alaska	25
Average days operating in Alaska	127

PURCHASES & PRODUCTION

West Coast Purchases
Total purchases: 64,600 mt
Purchase price: \$177/mt



347 ft average length

Total Mothership Allocation: 80,600 mt
Total Non-Tribal US Pacific Whiting TAC: 367,553 mt

*Note that some off-board costs are not collected. Therefore reported net revenue is an overestimate of actual net revenue.

Mothership Sector: 2016 Highlights¹

In 2016, six motherships owned by four companies processed Pacific whiting on the West Coast.

- The mothership fleet generated \$33.2 million in income and supported 798 jobs from purchases of Pacific whiting caught in the catch share program.
- The fleet spent 393 days operating on the West Coast in 2016, higher than any other year since the beginning of data collection. In 2016, the fleet spent 55% of its time operating in Alaska and 28% of its time processing and steaming on the West Coast, otherwise vessels were offloading and steaming between the West Coast and Alaska.
- West Coast motherships delivered to two ports: Blaine/Bellingham and Seattle. All six motherships that participated on the West Coast list Seattle as their home port.
- While operating on the West Coast, motherships employed an average of 78 processing crewmembers, fewer than recent years and baseline conditions. Processing crewmembers were compensated approximately \$11,800 for the year, slightly higher than 2014 and 2015 and 97% higher than the baseline period (2009-2010). Motherships also employed 25 non-processing crewmembers in 2016 that earned approximately \$30,200, which has risen steadily since the beginning of data collection.
- The fleet's price paid to catcher vessels for fish purchases in 2016 (\$177 per metric ton) was the lowest price since the implementation of catch shares. However, overall, the price paid to vessels for fish purchases per metric ton has increased 6% from the baseline years since the implementation of catch shares.
- The average revenue for all product types was \$2,270 per metric ton in 2016, a 10% decrease from the baseline period.
- Surimi production comprised the largest portion of revenue, with an average production value of \$2,600 per metric ton in 2016, similar to the baseline period. Fishmeal had an average production value of \$1,740 per metric ton in 2016, a 11% decrease compared to the baseline period.
- Vessels generated an average revenue of \$7.18 million and spent about \$6.22 million in fixed and variable costs, leading to a total cost net revenue of approximately \$960,000 per vessel for the year, representing the highest net revenue since 2011.
- Motherships earned \$91,000 and spent \$84,400 per day in costs, leading to a daily total cost net revenue of \$6,670 in 2016, slightly less than 2014, but higher than 2015 when catch attainment was low.

¹ Values reported in inflation-adjusted 2016 dollars. The pre-catch share baseline period is defined as the years 2009 and 2010. Despite having had historically low TAC in 2009 and 2010, these years are used as the baseline due to the burden on participants of requesting additional years of data.

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Acknowledgments

The Economic Data Collection (EDC) Program and EDC Reports reflect collaboration and coordination of individuals across the West Coast. There are numerous people to thank for their contributions to this effort.

We would like to acknowledge the efforts of all the Northwest Fisheries Science Center (NWFSC) economists and NWFSC Fishery Resource Analysis and Monitoring Data Team who provided a wide range of input into survey design, implementation, analysis, and technical support. The group worked together in an effort to distribute high quality data in a timely fashion. A special thanks to Marie Guldin, Amanda Warlick, Todd Lee, Abigail Harley, and Lily Hsueh for assistance in the development of these reports. We thank Su Kim of the NWFSC Scientific Communications Office for producing the infographics in these reports.

We appreciate the efforts of the Northwest Regional Office for support in the EDC Program development, outreach, and communication efforts. The Permit Office staff was particularly instrumental in ensuring compliance with the mandatory participation requirements.

The Northwest Division of the Office of Law Enforcement (OLE) and the National Oceanic and Atmospheric Administration (NOAA) Office of General Council helped extensively with many aspects of the EDC Program development and enforcement. They continue to collaborate with the EDC Program to ensure compliance. We thank the NWFSC Scientific Data Management staff for building the administrative tracking system and database, and the NWFSC Fishery Resource Analysis and Monitoring Data Team for continued support.

We thank PacFIN and AKFIN staff for providing access to important landings, permit, and vessel data. The staff at ODFW, WDFW, and CDFW also contributed with data used for the fielding of the baseline data collection. Other data and assistance with data interpretation were provided by the At-sea Hake Observer Program and the West Coast Observer Program.

We thank the Pacific Fishery Management Council and advisory bodies for their valuable comments on the EDC reports and data.

Finally, we thank the members of the West Coast fishing industry who met with us to discuss the development and implementation of data collection processes. We appreciate the time and effort of each participant that will continue to help improve the program in the coming years.

Report Introduction

About the Report

The US West Coast groundfish fishery takes place off the coasts of Washington, Oregon and California, and comprises over 90 different species of fish. Fish are harvested both commercially and recreationally. The commercial fishery has four components: limited entry with a trawl endorsement, limited entry with a fixed gear endorsement, open access, and tribal. In January 2011, the West Coast Limited Entry groundfish trawl fishery transitioned to the West Coast groundfish trawl catch share program. The catch share program consists of cooperatives for the at-sea mothership (including catcher vessels and motherships) and catcher-processor fleets, and an individual fishing quota (IFQ) program for the shorebased trawl fleet.²

The Economic Data Collection (EDC) Program is a mandatory component of the West Coast groundfish trawl catch share program, collecting information annually from all catch share participants: catcher-processors, catcher vessels, motherships, first receivers, and shorebased processors. The EDC information is used to monitor the economic effects of the catch share program, and consists of data on operating costs, revenues, and vessel and processing facility characteristics.

This report summarizes information collected from the West Coast mothership fleet. The EDC reports are also produced for the other sectors, and currently cover the years 2009 to 2016. The 2009 and 2010 data were collected in 2011 to provide a baseline of pre-catch share information. There is a one-year lag in collecting the EDC data to allow companies to close their accounting books. Thus, 2016 data were collected from May to September 2017. The EDC reports are updated annually to disseminate the data and contextualize its interpretation. The reports also serve as a catalyst for feedback on the data collected and its analysis. The scope of these reports continues to expand and the methods are refined with each publication.

The report is composed of three major sections. The first section, Mothership Overview (beginning on page 8), is an in-depth summary that contains descriptive analyses focusing on activities during 2016. The second section, Mothership Data Summaries (beginning on page 25), provides tables of all of the data collected from 2009 to 2016, with a detailed discussion of the methods used to summarize the data. The third section, Mothership Data Analysis (beginning on page 48), contains information about cost disaggregation and calculations of net revenue and economic performance. The data that form the basis for this report are confidential and must be aggregated or not shown so that individual responses are protected. More information about EDC Program administration, the EDC forms, data quality controls, data processing, and safeguarding confidential information can be found in the EDC Administration and Operations Report.³

² Information about the Catch Share Program is available at http://www.westcoast.fisheries.noaa.gov/fisheries/groundfish_catch_shares/.

³ Economic Data Collection Program, Administration and Operations Report available at: <http://www.nwfsc.noaa.gov/edc>.

Background - Economic Data Collection and West Coast Groundfish Trawl Catch Share Program

The economic benefits of the West Coast groundfish trawl fishery and the distribution of these benefits were expected to change under the West Coast groundfish trawl catch share program. To monitor these changes, the Pacific Fishery Management Council (PFMC) proposed the implementation of the mandatory collection of economic data. Using data collected from industry participants, the EDC Program monitors whether the goals of the catch share program have been met.

Many of the PFMC's goals for the catch share program are economic in nature. These goals include: provide for a viable, profitable, and efficient groundfish fishery; increase operational flexibility; minimize adverse effects from an IFQ program on fishing communities and other fisheries to the extent practical; promote measurable economic and employment benefits through the harvesting, processing, distribution, and support sectors of the industry; provide quality product for the consumer; and, increase safety in the fishery.

The EDC Program is also intended to help meet the Magnuson-Stevens Fishery Conservation and Management Act (MSA) requirement to determine whether a catch share program is meeting its goals, and whether there are any necessary modifications of the program to meet those goals. The data submitted to and analyzed by the EDC Program were fundamental to the formal 5-year review of the catch share program required under the MSA, finalized in early 2018.

Monitoring the economic effects of a catch share program requires a variety of economic data and analyses. The primary effects of a catch share program can be captured in two broad types of economic analysis: 1) economic performance measures, and 2) regional economic impact analysis. Both of these require information on the costs and earnings of harvesters and processors.

Economic performance measures include: costs, earnings, and profitability (net revenue); economic efficiency; capacity measures; economic stability; net benefits to society; distribution of net benefits; product quality; functioning of the quota market; incentives to reduce bycatch; market power; and, spillover effects in other fisheries. Some of these measures are presented in this report, while others would require more specific and involved analysis using EDC data.

Regional economic impact analysis measures the effects of the program on regional economies. The catch share program will likely affect different regional economies in different ways. Regional economic modeling involves tracking the expenditures of all businesses, households, and institutions within a given geographic region to arrive at the effects on income and employment. On the West Coast, the Northwest Fishery Science Center's IO-PAC model⁴ is used to estimate regional economic impacts using data from both the EDC survey forms and the voluntary cost earnings survey as model inputs.⁵

⁴ Leonard, J., and P. Watson. 2011. Description of the input-output model for Pacific Coast fisheries. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-111, 64 p.

⁵ For more information on cost earnings survey data collection process, see the Administration and Operations Report Draft Report (May 2016).

OVERVIEW

Management Context

In January 2011, the West Coast Limited Entry Groundfish Trawl fishery transitioned to the West Coast Groundfish Trawl Catch Share Program, consisting of an individual fishing quota (IFQ) program for the shorebased trawl fleet and cooperatives for the mothership and catcher-processor fleets. This report focuses on mothership vessels, which process fish delivered at sea by catcher vessels. The at-sea Pacific whiting fishery also includes catcher-processors, which are vessels that both catch fish and process them on-board. In 2016, the mothership fleet generated \$33.2 million in income and supported 798 jobs from purchases of Pacific whiting caught in the catch share program.¹

The domestic Pacific whiting fishery grew rapidly in the 1990s after the United States banned foreign vessels from processing Pacific whiting harvested off the West Coast. With the development of more efficient processes to transform Pacific whiting into surimi (a product popular in Asia), and certification from the Marine Stewardship Council (MSC)² in 2009, demand in the international market continued to rise throughout the 2000s and the Pacific whiting fishery subsequently transformed into one of the largest fisheries by volume in the United States.

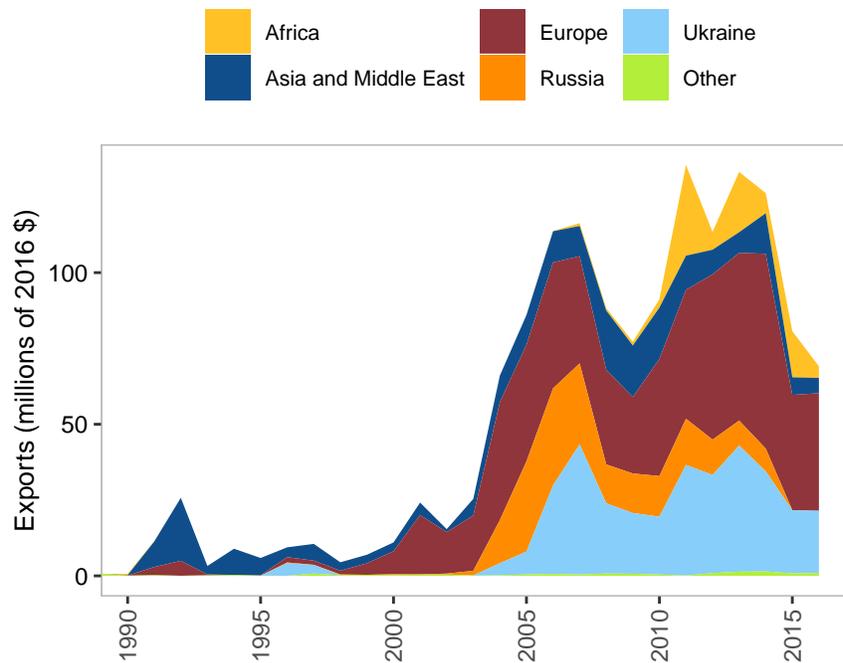


Figure 1: Total exports of fresh and frozen Pacific whiting (including mothership, catcher-processor, and shoreside production) from the U.S. by recipient region (millions of 2016 \$).

¹ Values calculated using the NWFSC IO-PAC model (Leonard, J., and P. Watson. 2011. Description of the input-output model for Pacific Coast fisheries. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-111, 64 p.)

² The MSC certification indicates that the West Coast Pacific whiting fishery has met the standard for “good management practices to safeguard jobs, secure fish stocks for the future and to help to protect the marine environment.” This certification has opened new markets, largely in the European Union, for Pacific whiting.

In 2016, approximately 36,600 metric tons of Pacific whiting worth just over \$69 million were exported from the United States,³ which was comparable to 2015 but lower than 2011-2014 (Figure 1). Since 2000, most of these exports went to the European Union, followed by Russia and Ukraine. In August 2014, Russia implemented trade sanctions against Europe and the United States banning imports of many seafood products, which may have led to decreased demand for whiting exports. To date, it is unknown when these sanctions will be lifted.

The PFMC and the National Marine Fisheries Service (NMFS) are responsible for managing the U.S. fishery for the coastal stock of Pacific whiting through a bilateral agreement between the United States and Canada, known as the Pacific Whiting Treaty. The United States and Canada signed an agreement in 2003 (which became law in 2007) that allocates a set percentage of the harvest quota to American and Canadian harvesters. The United States is allocated 73.88% and Canada the remaining 26.12%. Managers use annual harvest quotas to regulate the coast-wide catch of Pacific whiting. Regulations prohibit at-sea processing south of the Oregon-California border.

Once the total allowable catch (TAC) of Pacific whiting has been determined and the tribal sector's share has been apportioned, the remaining U.S. proportion is then allocated between the catcher-processor, mothership, and shoreside sectors. The mothership sector is allocated 24% while the catcher-processor and shoreside sectors are allocated 34% and 42%, respectively. Near the end of the season, NMFS often redistributes unharvested tribal allocations among the three commercial sectors.⁴

The TAC has varied substantially during the EDC data collections from 2009–2016.⁵

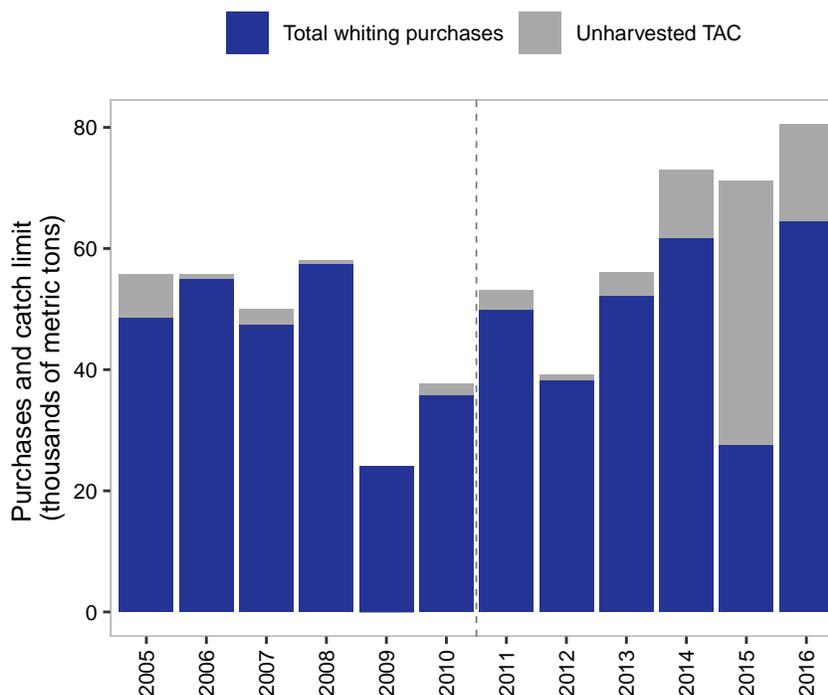


Figure 2: Mothership sector Pacific whiting catch limits, including reapportionments among sectors that may have occurred during the season, and total purchases indicating unharvested portion of allocation (thousands of metric tons). Dashed line represents the beginning of the catch share program.

³ NMFS Science and Technology Commercial Fisheries Statistics, <http://www.st.nmfs.noaa.gov/commercial-fisheries/foreign-trade/index>.

⁴ Notably, in 2008, catcher-processors received 6,000 metric tons of surplus mothership Pacific whiting. For allocation and season catch summaries going back through 2005, see http://www.westcoast.fisheries.noaa.gov/fisheries/management/whiting/whiting_reports_and_rulemakings.html.

⁵ PFMC, <http://www.pcouncil.org/groundfish/stock-assessments/by-species/pacific-whiting-hake/>.

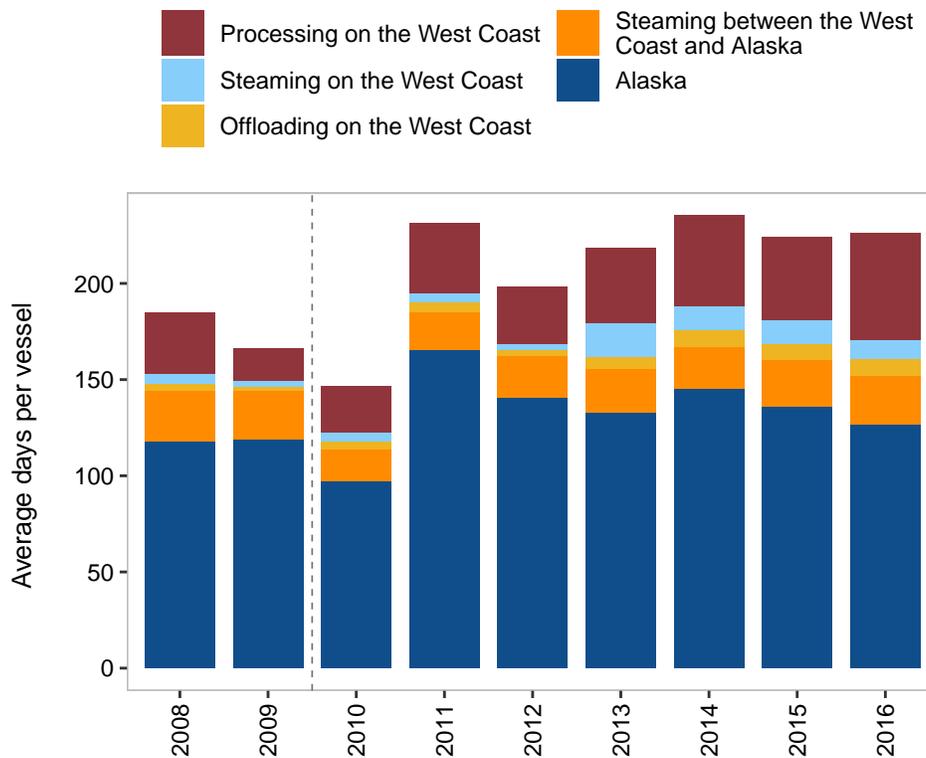


Figure 3: Average number of days spent in each activity per mothership vessel. Dashed line represents the beginning of the catch share program.

After several seasons of large Pacific whiting harvests from 2006-2008, managers lowered the catch limit in 2009, then raised it each year with the exception of 2012 and 2015 (Figure 2). In 2016, the mothership sector received an allocation of 80,600 metric tons of Pacific whiting; about 9,370 metric tons more than 2014 and 2015 (see Mothership Data Summaries, Table 7.1).

The fleet-wide amount of unharvested sector TAC is driven by a combination of factors including bycatch quota constraints, market demand, ex-vessel prices, participation in non-catch share fisheries, and prevailing ocean conditions that influence the aggregation or “catchability” of target species. From 2005-2014, motherships used at least 85% of their TAC. In 2015, catch attainment was low largely due to anomalous ocean conditions,⁶ and only 39% of the TAC was harvested. In 2016, harvest rates rose to 80%.

In addition to receiving an allocation of Pacific whiting, the mothership sector is also allocated quota for bycatch. In 2016, the mothership sector was allocated 120.0 metric tons of widow rockfish, 10.2 metric tons of Pacific ocean perch (after reallocation), 6.7 metric tons of darkblotched rockfish, and 5.8 metric tons of canary rockfish.⁷ The harvested proportion of these rebuilding species allocations

⁶ A large mass of warm water (known as “The Blob”) combined with El Niño conditions throughout 2015 caused complex, ecosystem-level changes that likely impacted the timing and availability of fish aggregations for certain target species in the catch share program. Therefore, net revenues, fuel costs, time spent steaming, and participation in other fisheries may be different in 2015 compared to other years.

⁷ Biennial Specifications and Management Measures; Inseason Adjustments, <https://www.gpo.gov/fdsys/pkg/FR-2016-09-01/pdf/2016-21091.pdf>.

has historically been relatively low with the fleet receiving deliveries in 2015 amounting to 17% of the allocated Pacific ocean perch, 14% of widow rockfish, 36% of darkblotched rockfish, and less than 3% of canary rockfish. In 2016 the harvested proportion of allocated Pacific ocean perch increased to 71% and the proportion of allocated widow rockfish increased to 62% , while darkblotched rockfish decreased to 24%, and canary rockfish slightly increased to 7% of the allocated amount.⁸ In 2016, motherships received less than one prohibited or protected fish per every 100 metric tons of Pacific whiting from catcher vessels.⁸ This included mostly Chinook salmon, but also chum salmon, Pacific halibut, and eulachon. Major non-prohibited bycatch species include widow rockfish, minor slope rockfish complex species, spiny dogfish, and squid. The bycatch rate in the mothership sector decreased by 49% between the baseline and catch share periods.⁹

NMFS has established mandatory rebuilding plans that limit bycatch for species that are designated “overfished.” Species that remain designated as overfished in 2018 include cowcod and yelloweye rockfish. In 2011, widow rockfish was taken off the overfished list.¹⁰ As a result, the annual catch limit for widow rockfish was raised starting in 2013. Similarly, canary rockfish was taken off the overfished list in 2015,¹¹ and the coast-wide annual catch limit has increased for both widow rockfish and canary rockfish in recent years. Pacific ocean perch, bocaccio, and darkblotched rockfish were declared rebuilt in 2017.^{12,13,14}

The flexibility introduced by the catch share program allows for the use of new bycatch reduction strategies. Both the catch share provision and the mothership catcher vessels’ cooperative charter state that reducing bycatch is a primary goal under the trawl catch share program. Several measures have been voluntarily agreed upon by the catcher vessel cooperative members, including the designation of bycatch “hotspots” and a prohibition on night fishing that is broader than what is required by regulation.

Mothership Sector Description

In 2016, four different companies owned the seven vessels with active permits in the West Coast mothership sector, and of these, six motherships participated in the fishery. These motherships process Pacific

⁸ 2016 Pacific whiting fishery summary: http://www.westcoast.fisheries.noaa.gov/publications/fishery_management/groundfish/whiting/2016-summary.pdf.

⁹ Whiting Mothership Coop Am 20 Mothership Catcher Vessel Cooperative Annual Report 2016: http://www.pcouncil.org/wp-content/uploads/2017/03/Sup_IR1_2017_WMC_Rpt_re2016WithAttachments_Apr2017BB.pdf.

¹⁰ NMFS 2011. Status of the widow rockfish resource in 2011: http://www.pcouncil.org/wp-content/uploads/Widow_2011_Assessment.pdf.

¹¹ NMFS 2015. Status of canary rockfish in the CA current in 2015: http://www.pcouncil.org/wp-content/uploads/2015/05/D8_Att1-Canary_2015-FULL-E-Only_JUN2015BB.pdf.

¹² Draft Stock assessment update: Status of Bocaccio in the Conception, Monterey and Eureka INPFC areas for 2017. http://www.pcouncil.org/wp-content/uploads/2017/05/F4_Att3_2017_Bocaccio_Assessment_DraftFull_Version_Electronic_Only_Jun2017BB.pdf

¹³ Status of the darkblotched rockfish resource off the continental U.S. Pacific Coast in 2017. http://www.pcouncil.org/wp-content/uploads/2017/05/F4_Att4_DBRK_2017_Assessment_Update_Full-ElectronicOnly_Jun2017BB.pdf

¹⁴ Status of the Pacific ocean perch along the U.S. West Coast in 2017. http://www.pcouncil.org/wp-content/uploads/2017/10/F4_Att1_Full-E-only_PacificOceanPerch2017_Assessment_NOV2017BB.pdf

whiting (*Merluccius productus*), also known as Pacific hake, on the West Coast. Motherships are large vessels, with those participating on the West Coast in 2016 being approximately 347 feet long with a fuel capacity of about 366,000 gallons.

In 2016, the mothership fleet purchased approximately 64,600 metric tons of Pacific whiting, greater than any other year since the beginning of data collection, largely reflecting increases in TAC. Mothership fleet purchases accounted for 25% of coast-wide Pacific whiting harvests in 2016, representing a 21% increase from the baseline period.

Two types of vessels participate in the Pacific whiting mothership sector: traditional motherships that also act as a mothership in Alaska, and catcher-processor vessels that only act as a mothership on the West Coast. Both types of vessels spend a large portion of their time in the Alaska pollock fishery in the Bering Sea and Aleutian Islands. Companies managing mothership vessels must balance several factors when deciding when and where to operate throughout the year, including fish prices, bycatch quota attainment, and opportunities to participate in other fisheries. Participation in the West Coast whiting fishery largely depends on market conditions, ex-vessel prices, and opportunities in Alaska, and has generally mirrored changes in TAC.

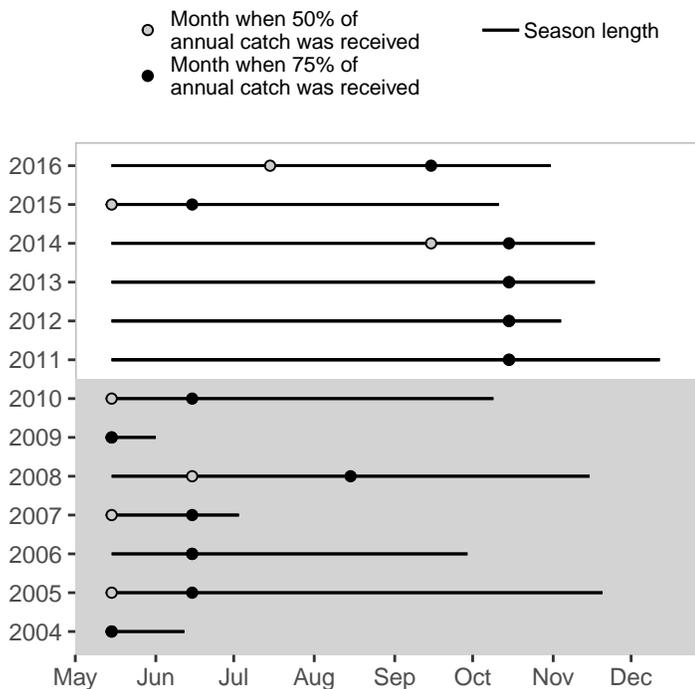


Figure 4: Season length for the mothership whiting fishery, with horizontal lines representing when the first and last whiting was received. The open and closed circles represent the month when 50% and 75% of the annual catch was received, respectively. The shaded region represents the period prior to the implementation of catch shares.

In 2016, mothership vessels spent approximately half of their time (55%) processing Alaska pollock in the Bering Sea and Aleutian Islands off Alaska, otherwise they were operating on the West Coast or steaming between the West Coast and Alaska (Figure 3). In 2016, the average mothership spent 66 days processing fish and steaming along the West Coast, the highest since the beginning of data collection, with a 2 fold increase from the baseline period to catch shares years. Motherships on average spent 25 days steaming between the West Coast and Alaska (See Mothership Data Summaries, Table 2.1 for more information on fleet activity). The fleet as a whole took 25 one-way trips to and from Alaska in 2016, which has ranged from 18 to 28 since 2009. West Coast motherships deliver Pacific whiting primarily to two ports in Washington state: Blaine/Bellingham and Seattle. All of the motherships that participated in the West Coast whiting fishery list Seattle as their home port.

In 2009 before the implementation of the catch share program, the Council recommended sector-specific bycatch quota allocations for the at-sea sectors, which resolved competition for constraining bycatch species catches. These bycatch quota allocations, combined with catch shares, provided improved operational flexibility, particularly for the mothership sector that was not already operating under a cooperative. This flexibility is evident in changes in season length (the number of days from the first to the last haul¹⁵) (Figure 4). The mothership fleet had processed at least half of their annual quota by the end of May for five out of the seven years leading up to the implementation of catch shares. By comparison, with the exception of 2015, processing continued into October in years after the implementation of catch shares (Figure 4), indicating that the cooperative framework may facilitate increased operational flexibility.

Economic Indicators

The EDC Program tracks economic indicators by compiling information submitted by participants about how expenses and revenue change over time. All values reported here in the Overview section are in inflation-adjusted 2016 dollars. Pre-catch share data for the 2009 and 2010 operating years were submitted in 2011 and have been averaged to calculate “baseline” conditions within the fishery to which subsequent years of data can be compared. Despite having had historically low TAC in 2009 and 2010, these years are used as the baseline due to the burden on participants of requesting additional years of data.

Variable Costs

Mothership vessel costs are separated into two categories: variable costs and fixed costs. Variable costs comprise the majority of a vessel's total expenditures and include fish purchases, fuel, crew compensation, food, additives, packaging and materials, and observer coverage. Variable costs vary with the level of fishery participation, and were lowest in 2009 (\$2.08 million), highest in 2014 (\$6.72 million), and amounted to \$5.12 million per vessel in 2016 (see Mothership Data Summaries, Table 9.1).

Pacific whiting purchases constituted the largest portion of variable costs (\$1.91 million), followed by processing crew compensation (\$973,000) and non-processing crew compensation (\$739,000). Overall expenditures on fish purchases increased substantially from 2009-2014 (reflecting changes in TAC), declined in 2015 due to low catch attainment, and rose again slightly in 2016 (Figures 2 and 5). As noted above, the volume of Pacific whiting purchases in 2016 was the highest since the beginning of data collection, but average fish purchase cost per vessel (\$1.91 million) was relatively low due to the lowest price paid to catcher vessels since 2009 (\$177 per metric ton).

Crewmembers include line workers, fishmeal crew, quality control, technicians, cleanup, factory managers, combis, and mechanics who work on processing equipment. Since 2011, motherships have employed an average of 75 processing crewmembers, slightly less than the baseline years (88 crewmembers).

¹⁵ Under current regulations, motherships can begin processing at sea on May 15.

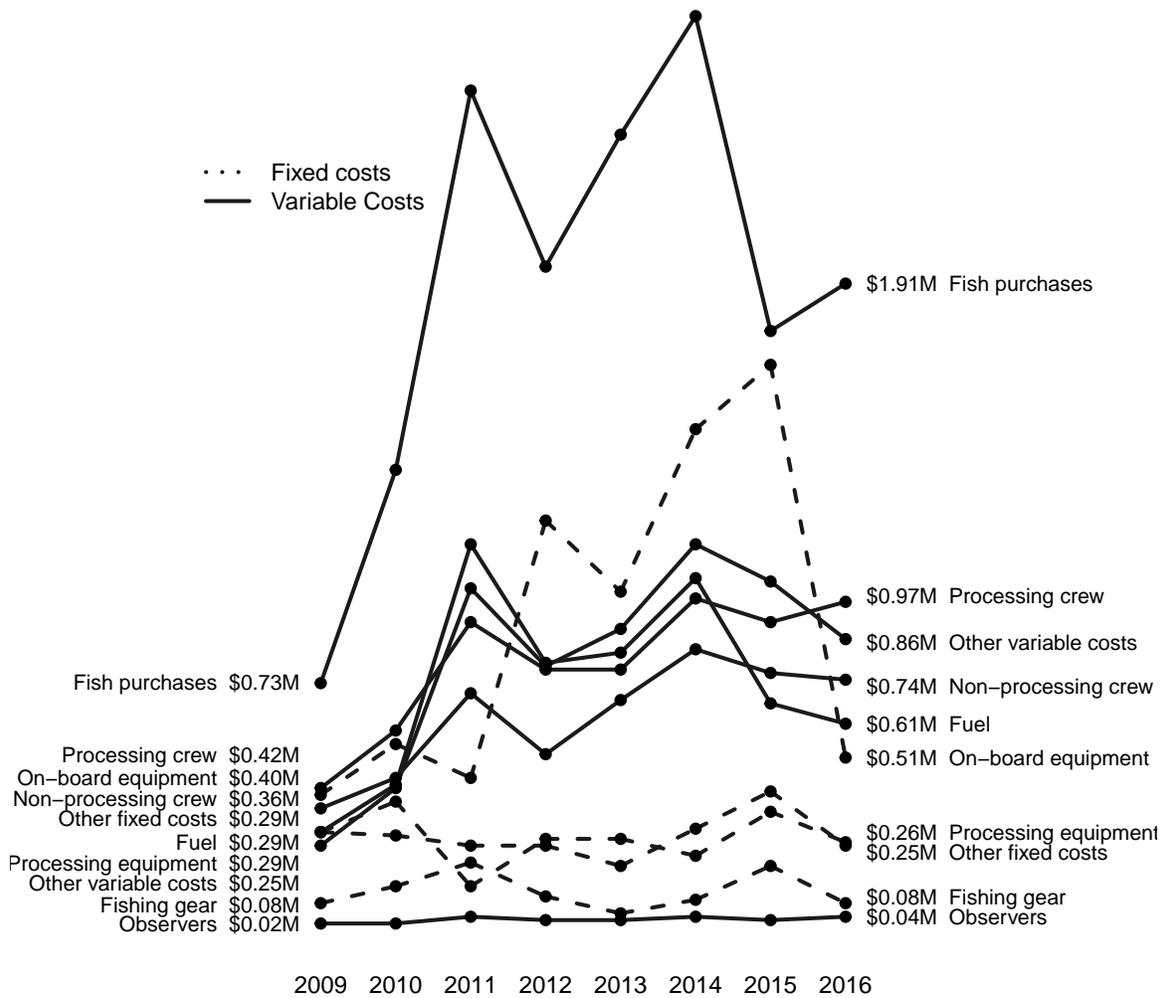


Figure 5: Average fixed (dashed line) and variable costs (solid line) per vessel (millions of 2016 \$).

Average annual processing crewmember compensation was \$11,800 in 2016, with an overall 2 fold increase from the baseline period to catch share years.

Motherships employed an average of 25 non-processing crew in 2016, the fewest since the beginning of data collection. However, annual compensation per non-processing crewmember has risen steadily from 2009 (\$10,000) to 2016 (\$30,200), for an overall 84% increase from the baseline period to catch share years.

Fuel and lubrication constitute one of the largest cost categories for the fleet on the West Coast, with total costs varying with fuel prices. The Pacific States Marine Fisheries Commission tracks historical marine fuel prices, which in Washington state have ranged from \$1.73 in February of 2016 to a high of \$4.10 in April of 2012.¹⁶ Average daily fuel use across all West Coast activities (processing and

¹⁶ PSMFC 2017. West Coast and AK Marine Fuel Prices Annual Report, <https://www.psmfc.org//efin/docs/2016FuelPriceReport.pdf>.

steaming) has ranged from 5,040 to 6,530 gallons per day since 2009 and was 5,550 gallons in 2016. Though fuel prices and usage have varied since the beginning of data collection, average fuel expenses reported by motherships on the West Coast have increased by 2 fold from the baseline period to catch shares years (Figure 5), likely reflecting the lengthened season and increasing number of operating days corresponding with the increasing TAC.

Observer coverage on motherships dates back to the MSA, first passed in 1976. Mothership vessels, like the rest of the processing fleet, have continued to have observers on board while operating in the West Coast Pacific whiting fishery after the implementation of the catch share program. The average annual cost of observer coverage for motherships has increased 2 fold from the baseline period to catch shares years and amounted to \$47,400 in 2016, remaining one of the smallest cost categories collected on the EDC survey.

The MSA requires that NMFS compute and collect cost recovery fees from participants of limited access privilege programs, such as catch shares, to recover additional government costs attributable to the private sector use of a public resource. Cost recovery fees were implemented for the West Coast groundfish fishery in 2014 and are calculated yearly, not to exceed 3% of ex-vessel value. Unlike catcher-processors, fees for the mothership sector are paid by catcher vessels that deliver the fish.¹⁷

Fixed Costs

Fixed costs include capitalized expenditures and expenses on vessel and on-board equipment, fishing gear for catcher vessels, and processing equipment. In general, these do not vary with fishing effort as much as variable costs. Average annual expenditures on vessel and on-board equipment, fishing gear, and processing equipment were highest in 2015 (\$2.22 million) and amounted to \$846,000 in 2016 (Figure 5).

Revenue

¹⁷ For more information on cost recovery fees, see the Compliance Guide at http://www.westcoast.fisheries.noaa.gov/publications/fishery_management/groundfish/public_notices/cost-recovery-compliance-guide.pdf.

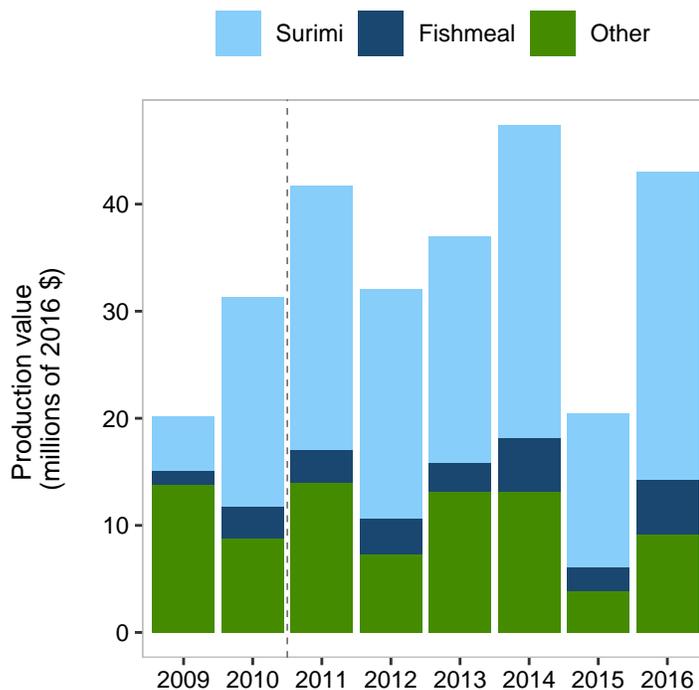


Figure 6: Fleet-wide production value by product type (millions of 2016 \$). Other includes fillets, fish oil, headed and gutted, minced, and round, and are combined to protect confidential data. Dashed line represents the beginning of the catch share program.

Earnings sources on the EDC survey form include the total value received for processed product, sale or lease of mothership-endorsed permits, chartering, and insurance settlements, though participants have only reported fish production revenue to date. Total and average production values are summarized by product type, per vessel, per day, and per metric ton produced (See Data Summaries Tables 8.2, 12.1, 12.2, and 12.2 for more detailed information).

The average production value of all Pacific whiting products was about \$7.18 million per vessel, representing a 77% increase from baseline conditions to catch shares years. Surimi, with an average production value of \$2,600 per metric ton, comprised the largest portion of production revenue (Figure 6) and production weight (Figure 7). Fishmeal had an average production value of \$1,740 per metric ton in 2016, with an overall 5% growth from baseline conditions to catch share years (Figure 8). The “Other” category includes fillets, fish oil, fish sold in the round, or headed and gutted fish, and fluctuates in volume and value from year to year (Figures 6 and 7).

The product markup (total production value divided by total fish purchase costs) decreased from 4.57 to 3.15 during 2009-2013 (as the average production value remained constant but purchase prices increased) but has risen again to 3.77 in 2016. The product recovery rate (total production weight divided by total fish purchase weight) has been higher since 2011 (0.38) compared to the baseline years (0.33), but was 0.29 in 2016, the lowest since the implementation of catch shares.

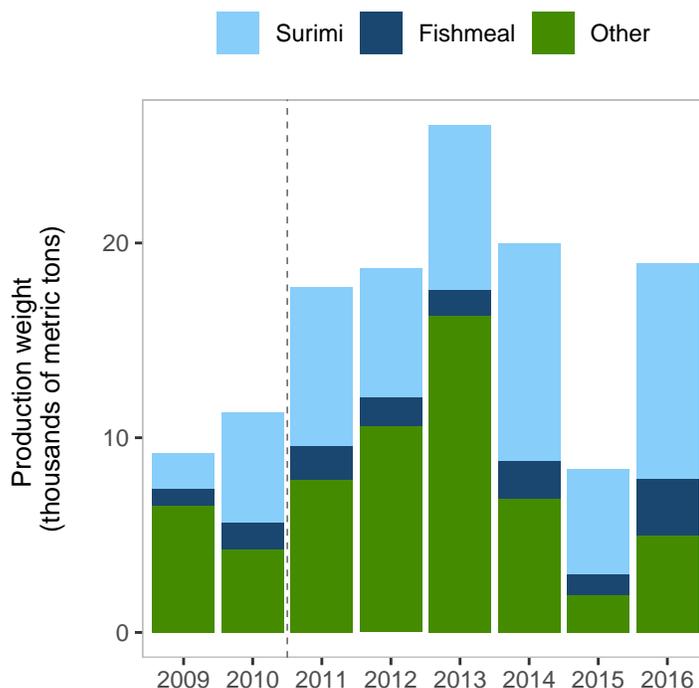


Figure 7: Fleet-wide production weight by product type (thousands of metric tons). Other includes fillets, fish oil, headed and gutted, minced, and round, and are combined to protect confidential data. Dashed line represents the beginning of the catch share program.

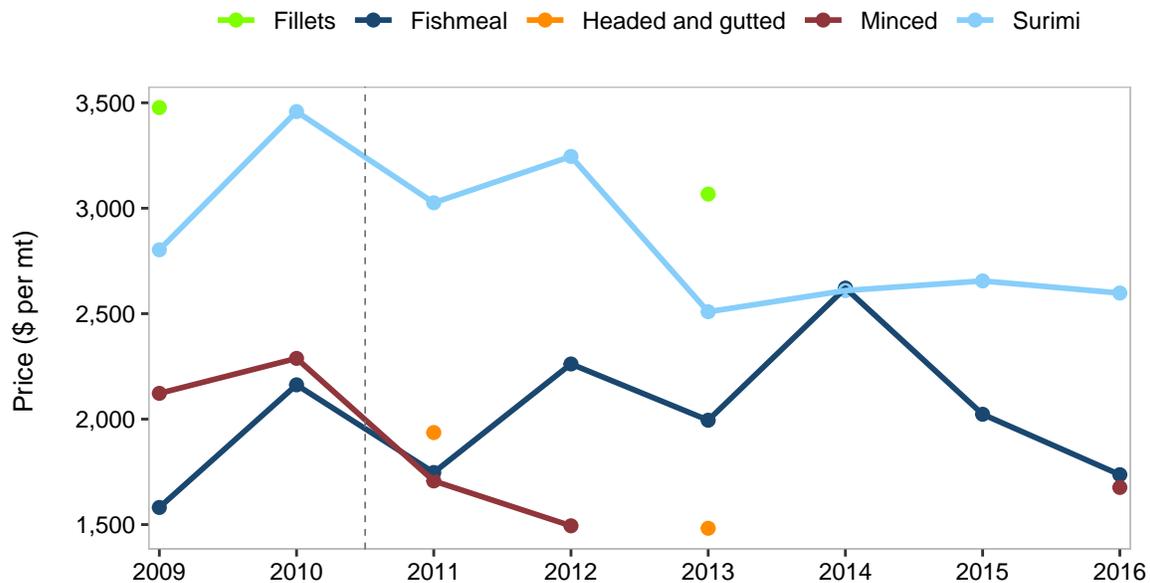


Figure 8: Average price by product type (2016 \$). Some values are suppressed to protect confidential information. Product types such as minced, fillets, and fish oil delineated here were combined in Figures 6 and 7. Dashed line represents the beginning of the catch share program.

Net Revenue

The EDC Program measures the net economic benefits of the catch share program by reporting two types of net revenue. The first is variable cost net revenue, which is revenue minus variable costs. The second is total cost net revenue, which is revenue minus both variable and fixed costs.¹⁸ To provide a complete picture of the changes that have occurred, net revenue is presented at two scales. Figure 9 shows the total fleet-wide net revenue for the fishery, while Figure 10 shows net revenue for the average vessel. Both figures only include revenues and costs associated with the West Coast catch share program. It is important to note that the EDC forms aim to capture only costs that are directly related to vessel fishing operations, and not costs that are related to activities or equipment off the vessel. Therefore, the net revenue reported here is an overestimate of the true net revenue.¹⁹

From baseline conditions in 2009 and 2010, the fleet has experienced increasing revenue and variable costs with the exception of 2015 when catch attainment was low. In 2016, motherships generated a total fleet-wide revenue of \$43.1 million and spent about \$37.3 million in fixed and variable costs, leading to a total cost net revenue (revenue minus all costs) of approximately \$5.76 million, higher than any other year since the beginning of data collection (Figure 9). Though total revenue was highest in 2014, costs were also higher, therefore leading to a higher net revenue in 2016 by 71%.

In terms of revenue per vessel, motherships generated an average revenue of \$7.18 million and spent about \$6.22 million in fixed and variable costs, leading to a total cost net revenue of approximately

¹⁸ See Figure 5 for a description of which costs are considered variable costs and which costs are considered fixed costs.

¹⁹ See Mothership Data Summaries Section 9: Costs and Section 11: Net Revenue and Economic Profit for a more complete discussion of variable costs, fixed costs, and the calculation of net revenue.

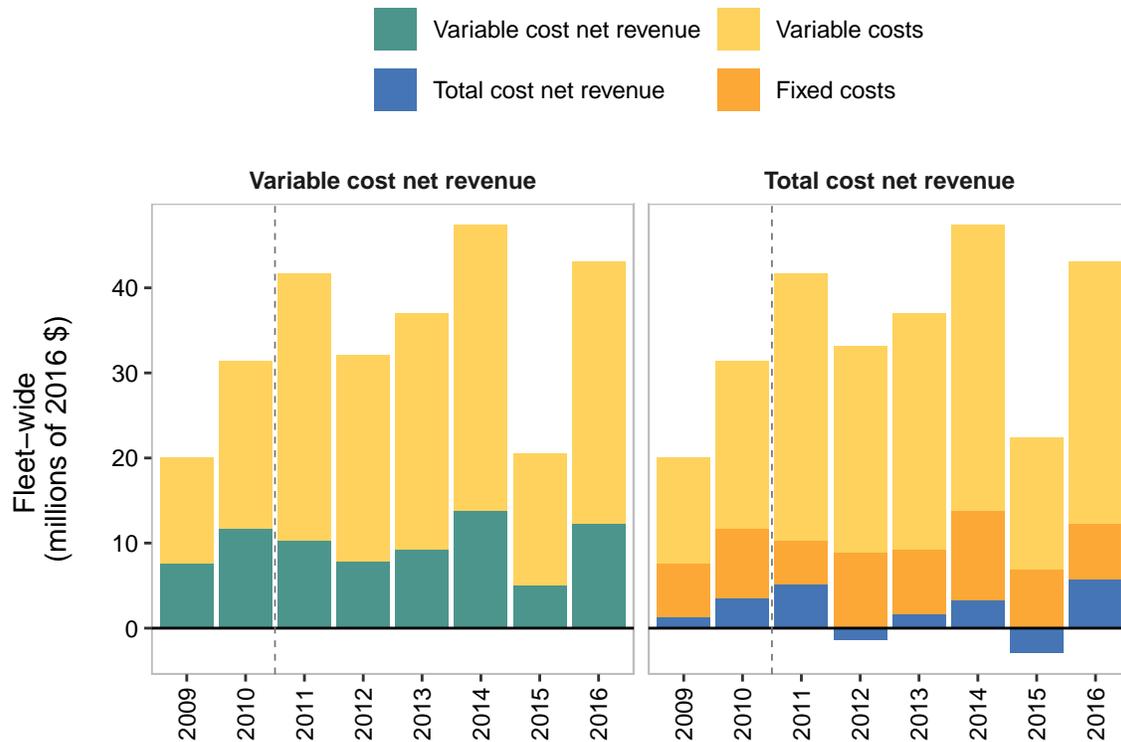


Figure 9: Fleet-wide variable cost net revenue (revenue minus variable costs) (left) and fleet-wide total cost net revenue (revenue minus variable costs and fixed costs) (right) (millions of 2016 \$). Dashed line represents the beginning of the catch share program.

\$960,000 per vessel for the year (Figure 10), just slightly less than the highest value since the beginning of data collection that was observed in 2011.

Many of the above patterns in costs and revenue are also evident in daily and production value rates. Daily production value per vessel has generally decreased since 2009 as the number of days spent operating on the West Coast has increased, amounting to \$91,000 per day in 2016. Motherships earned a variable cost net revenue per metric ton produced of \$460 in 2016 for an overall 56% decrease from the baseline to catch share years (see Mothership Data Summaries, Table 12.2).

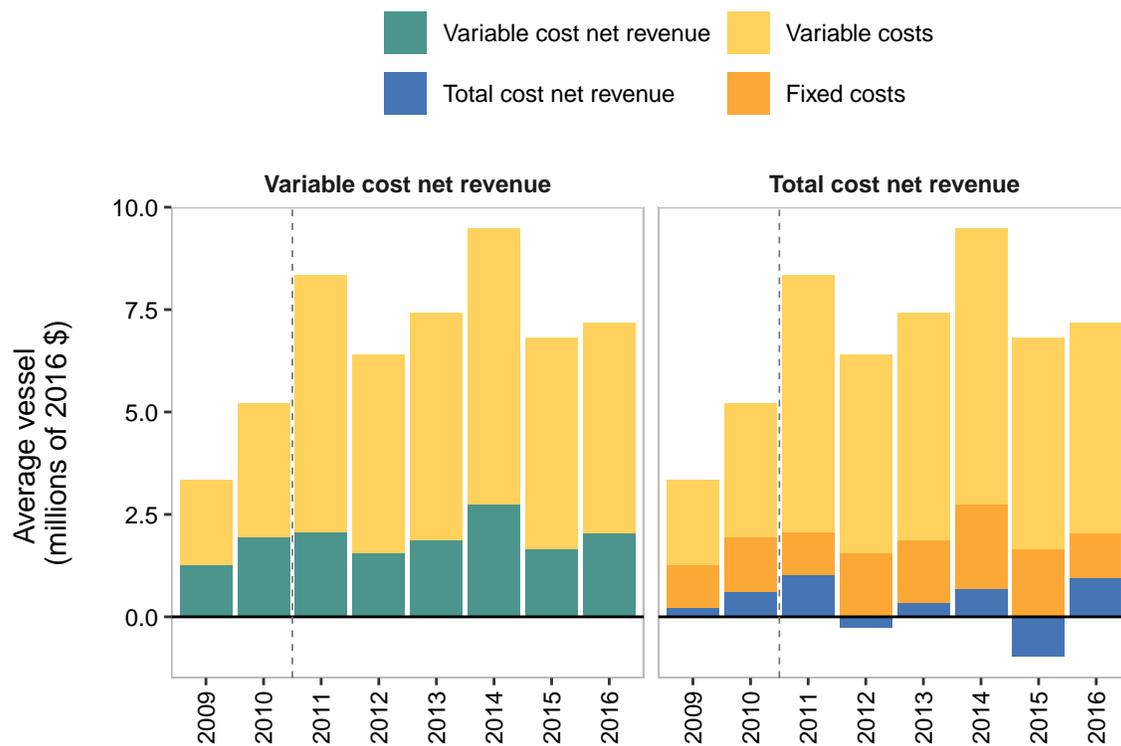


Figure 10: Average variable cost net revenue (revenue minus variable costs) (left) and average total cost net revenue (revenue minus variable costs and fixed costs) (right) (millions of 2016 \$). Dashed line represents the beginning of the catch share program.

Mothership Report

MOTHERSHIP REPORT

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Mothership Data Summaries

1 Introduction

1.1 Background

The US West Coast groundfish fishery takes place off the coasts of Washington, Oregon and California, and comprises over 90 different species of fish. Fish are harvested both commercially and recreationally. The commercial fishery has four components: limited entry with a trawl endorsement, limited entry with a fixed gear endorsement, open access, and tribal. In January 2011, the West Coast Limited Entry groundfish trawl fishery transitioned to the West Coast groundfish trawl catch share program. The catch share program consists of cooperatives for the at-sea mothership (including catcher vessels and motherships) and catcher-processor fleets, and an individual fishing quota (IFQ) program for the shorebased trawl fleet.¹

The Economic Data Collection (EDC) Program² was implemented as part of these new regulations to monitor the economic effects of the catch share program. Annual economic data submissions are required from all fishery participants: catcher vessels, motherships, catcher-processors, and first receivers and shorebased processors §50 CFR 660.114. Baseline, pre-catch share data were submitted in 2011 for the 2009 and 2010 operating years. Data for the first year the fishery operated under the catch share program (2011) were submitted in 2012, and the 2016 data submitted for this report were collected in 2017.

The EDC Program has enhanced the quantity and quality of economic information available for analysis, and for the management of the West Coast groundfish trawl fishery. While costs and earnings data are available for shorebased catcher vessels starting in 2004,³ this is the first data collection series for

¹ Information about the Catch Share Program is available at <http://www.westcoast.fisheries.noaa.gov/fisheries/groundfish.catch.shares/>.

² Additional information on the EDC Program, including the EDC data collection forms can be found at <http://www.nwfsc.noaa.gov/edc>.

³ Lian, C.E. 2010. West Coast limited entry groundfish trawl cost earnings survey protocols and results for 2004. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-107, 35 p.

the mothership fleet. This report summarizes the 2009-2016 EDC mothership survey data, and with its companion reports covering the other sectors, is the fifth in the series of reports. The scope of these reports continues to expand and the methods are refined with each publication.

1.2 Understanding the report

The data provided in the summary tables throughout the report are for all vessels that fished on the West Coast during the survey year, unless otherwise noted. Unlike the Overview section, all numbers reported in the Data Summaries are generated from the raw responses received from participants and, therefore, are in nominal dollars.

All data submitted via the EDC Program are confidential under 402(b) of the Magnuson-Stevens Act (16 U.S.C. 1801, et seq.) and under NOAA Administrative Order 216-100.⁴ In order to protect these data, a rule of three and a rule of 90-10 are implemented. The rule of three requires a response from at least three companies in order to show a summary statistic. The 90-10 rule requires that no single company's value comprise over 90 percent of the value displayed. In the case of the West Coast whiting mothership fishery, there are only four companies. The tables show a '***' for data points where there are less than three companies reporting the information, and/or where one company's responses account for greater than 90 percent of the average value. Zeroes are shown if all entities report zeroes. More information about how confidential data are protected in the EDC Program can be found in the Administration and Operations Report. Simple means are reported for statistics that denote the performance of an average entity (*i.e.*, net revenue) while weighted means are reported for statistics that describe characteristics of the fishery (*i.e.*, ex-vessel prices, markup, recovery rates, etc.). Additionally, “—” is used to denote fields where the question was not asked on the form in that survey year.

In order to track and assess the variation of data submitted by participants across any given variable or statistic, these reports include the coefficient of variation (CV) of the mean. The stacked dots included in the data tables provide information about the coefficient of variation (CV) of the mean. We use the following scoring:

- represents $CV < 0.5$,
- represents $0.5 \leq CV < 1.0$,
- ◐ represents $1.0 \leq CV < 2.0$, and
- ◑ represents $2.0 \leq CV$. For 2009-2016, none of the CVs exceeded 2.83.

Although participants are identified on a calendar year basis, survey forms are completed using information based on their fiscal year. The fiscal year can span more than one calendar year, but, to date, there is no vessel where the fiscal year spans more than one whiting season.

The EDC survey form has not changed significantly since the baseline 2009-2010 data collection. One change to the forms from 2009-2010 to the present pertained to offload locations, with “Tacoma”

⁴ For more information about form administration, please see Administration and Operations Report.

substituted for “Westport, Hoquiam” in response to input on the 2009 and 2010 surveys. In 2012, a space was added for participants to provide the total round weight harvested in the West Coast fisheries in addition to that harvested in Alaska/Other, in order to validate the external data source that was used to calculate revenue from West Coast whiting. In 2013, a new question was added, “Provide the total number of individuals who worked for you”. Respondents provide the total number of processing crew and the total number of non-processing crew, creating an upper bound of the total number of people employed by the sector.

1.3 Purpose of the report

This report, like the other four EDC reports,⁵ has multiple objectives. The first is to provide basic economic data summaries that can be used for a variety of purposes associated with fishery management. Since much of the data collected are confidential under the 2007 reauthorization of the MSA, the data are summarized as averages or totals. Thus summarized, the reports make the data available to the public for both research and informational purposes.

Second, the reports provide information that can be used to examine the performance of the catch share program in terms of whether and to what degree the goals of the program are being met. It is expected that additional modeling will provide increased detail about program impacts. These reports and underlying data and analyses served as the basis for the 5-year review of the catch share program mandated by the MSA and finalized in 2018, as well as the NMFS National Catch Shares Performance Indicators.

Third, the reports serve as the basis for economic models that are used as part of the PFMC’s biennial specification process for groundfish management. These models include the IO-PAC model,⁶ as well as estimates of revenue, costs, and net revenue.

Lastly, and perhaps most importantly, the data reports are expected to serve as a useful catalyst for feedback on the data collected and its analysis.

The Administration and Operations Report describes the EDC Program administration and fielding of the surveys, the EDC forms, data quality controls and quality checks and data processing, and safeguarding confidential information. The other EDC reports provide basic data summaries of the catcher vessel, catcher-processor, and first receiver and shorebased processor forms.

⁵ In addition to the mothership report, there are four companion reports:

- Economic Data Collection Program, Administration and Operations Report (May 2016)
- Economic Data Collection Program, Catcher-Processor Report 2009-2016 (2018)
- Economic Data Collection Program, Catcher Vessel Report 2009-2016 (2018)
- Economic Data Collection Program, First Receiver and Shorebased Processor Report 2009-2016 (2018)

⁶ Leonard, J., and P. Watson. 2011. Description of the input-output model for Pacific Coast fisheries. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-111, 64 p.

1.4 Mothership form administration

Completion of EDC forms is mandatory for participants in the catch share program. Survey participants are identified using contact information provided by the Northwest Regional Permit Office. The regulations for defining who is required to complete an EDC form differs between the baseline data collection (2009 and 2010) and all annual/ongoing data collections for 2011 onward. For the baseline period, all owners, lessees, and charterers of a mothership vessel that received whiting in 2009 or 2010 as recorded in NMFS' NORPAC database §660.114(b)(3)(i) were required to complete an EDC form. For 2011 and beyond, all owners, lessees, and charterers of a mothership vessel registered to a mothership permit at any time are required to complete an EDC form §660.114(b)(3)(ii). For permit owners, a mothership permit application will not be considered complete until the required EDC form for that permit owner is submitted, as specified at §660.25(b)(4)(i). For a vessel owner, participation in the groundfish fishery (including, but not limited to, changes in vessel registration) will not be authorized until the required EDC form for that owner for that vessel is submitted, as specified, in part, at §660.25(b)(4)(v). For a vessel lessee or charterer, participation in the groundfish fishery will not be authorized until the required EDC form for their operation of that vessel is submitted.

A calendar year is used to determine which vessels meet the criteria. For example, in 2017, data were collected from all owners, lessees, and charters of a mothership registered to a limited entry trawl permit during 2016. The forms are fielded on this schedule in order to allow participants the time necessary to complete their taxes, which may contain information required on the EDC forms.

If a form has missing information, or the information provided on the form is believed to be incorrect, EDC Program staff attempt to contact the participant to correct the information. Data are validated and verified with external data sources whenever possible. These data sources include the Northwest Regional Permit Office and the At-Sea Hake Observer (A-SHOP) program.

2 Vessel Participation on the West Coast and in Alaska

The mothership fleet participates in fisheries on the West Coast and Alaska. Table 2.1 provides the average days at sea by activity listed. Participants are instructed to count partial days as full days when recording days at sea on the forms. Table 2.2 presents the average number of one-way trips vessels made steaming between Alaska and the West Coast that year. Table 2.3 presents the number of vessels that processed fish within the catch share program on the West Coast and Alaska.

Table 2.1: Average days at sea. Average days at sea by activity on the West Coast (WC) and in Alaska (AK) for mothership vessels (N = number of vessels with non-zero, non-NA responses).

Activity	2009		2010		2011		2012		2013		2014		2015		2016	
	Mean	N														
Processing on the WC	17	6	24	6	51	5	42	5	47	5	47	5	43	3	56	6
Offloading on the WC	2	6	4	6	7	5	5	5	7	5	9	5	9	3	9	6
Steaming on the WC	3	6	4	6	7	5	4	5	21	5	12	5	12	3	10	6
Steaming between WC and AK	25	6	20	5	20	7	21	7	23	6	22	6	24	5	25	6
Operating in AK	119	6	117	5	165	7	141	7	133	6	146	6	136	5	127	6

Table 2.2: Average number of trips to Alaska. Mean number of one-way trips between the West Coast and Alaska (N = number of vessels with non-zero, non-NA responses).

	2009		2010		2011		2012		2013		2014		2015		2016	
	Mean	N														
One-way trips to Alaska	4	6	4	5	4	7	4	7	4	6	4	6	4	5	4	6

Table 2.3: Number of vessels that processed fish on the West Coast and in Alaska. Number of vessels that processed fish on the West Coast and in Alaska since the beginning of data collection.

Location	2009	2010	2011	2012	2013	2014	2015	2016
Alaska	6	5	7	7	6	6	5	6
West Coast	6	6	5	5	5	5	3	6

3 Delivery Locations

Participants report the percentage of all West Coast whiting products offloaded from the mothership vessel at each major West Coast port. Table 3.1 lists the number of vessels delivering to each location. Some vessels delivered to more than one location in a given year.

Table 3.1: Delivery locations. Total number of vessels that offloaded in each location. Some vessels delivered to multiple locations in the same year.

Location	2009	2010	2011	2012	2013	2014	2015	2016
Astoria	0	0	1	0	0	0	0	0
Blaine/Bellingham	1	3	3	3	3	1	1	3
Coos Bay	0	0	0	0	0	0	0	0
Port Angeles	0	0	0	0	0	0	0	0
Seattle	5	5	2	2	3	4	3	4
Tacoma	—	0	0	0	0	0	0	0
At-sea	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0

4 Vessel Physical Characteristics

Survey participants provide basic information about the vessel and its physical characteristics, including market value, replacement value, vessel length, horsepower of main engines, and fuel capacity from the most recent marine survey (Table 4.1). Marine surveys are done on a regular basis and are often required for insurance, financing, and other purposes.

Table 4.1: Vessel characteristics. Average market value (millions of \$), replacement value (millions of \$), vessel length (feet), horsepower of main engines (thousands), and fuel capacity (thousands of gallons) (N = number of EDC vessels with non-zero, non-NA responses).

Characteristic	2009		2010		2011		2012		2013		2014		2015		2016	
	Mean	N														
Market value	54 [·]	4	54 [·]	4	49 [·]	5	51 [·]	5	46 [·]	4	56 [·]	4	56 [·]	4	51 [·]	5
Replacement value	108 [·]	4	108 [·]	4	99 [·]	5	100 [·]	5	100 [·]	4	122 [·]	4	142 [·]	4	133 [·]	5
Vessel length	360 [·]	6	360 [·]	6	347 [·]	7	347 [·]	7	299 [·]	6	355 [·]	6	356 [·]	6	347 [·]	7
Horsepower	9 [·]	6	9 [·]	6	8 [·]	7	8 [·]	7	5 [·]	6	8 [·]	6	8 [·]	6	8 [·]	7
Fuel capacity	398 [·]	6	398 [·]	6	361 [·]	7	359 [·]	7	236 [·]	6	398 [·]	6	398 [·]	6	366 [·]	7

Participants also provide information about whether the vessel was hauled out at any point during the year, which provides context that may be used to explain major costs associated with vessel repair and maintenance. Since 2009, a large proportion of all active fishing vessels have been hauled out in a given year (Table 4.2).

Table 4.2: Number of vessels hauled out. Number (N) and percentage (%) of vessels that were hauled out during the year.

Haul out	2009		2010		2011		2012		2013		2014		2015		2016	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Yes	3	50%	1	17%	2	29%	3	43%	3	50%	2	33%	4	67%	3	43%
No	3	50%	5	83%	5	71%	4	57%	3	50%	4	67%	2	33%	4	57%

5 Vessel Fuel Use

Participants provide information about average fuel use per day and total fuel use per year when engaged in operations on the West Coast (Tables 5.1 and 5.2). The total annual fuel usage by vessels during the survey year in the West Coast whiting fishery excludes fuel used for steaming between the West Coast and Alaska.

Table 5.1: Average daily fuel use. Average daily fuel use (thousands of gallons) while steaming and processing in the West Coast whiting fishery and steaming between the West Coast and Alaska (N = number of vessels with non-zero, non-NA responses).

Activity	2009		2010		2011		2012		2013		2014		2015		2016	
	Mean	N														
Processing and steaming on West Coast	6.5 [*]	6	6.5 [*]	6	5.0 [*]	6	5.9 [*]	5	5.5 [*]	5	6.2 [*]	5	5.7 [*]	3	5.5 [*]	6
Steaming between West Coast and Alaska	6.7 [*]	6	6.5 [*]	6	5.4 [*]	7	6.3 [*]	7	4.7 [*]	6	6.1 [*]	6	4.7 [*]	5	5.4 [*]	6

Table 5.2: Annual fuel use. Average total fuel use (thousands of gallons) (N = number of vessels with non-zero, non-NA responses).

Activity	2009		2010		2011		2012		2013		2014		2015		2016	
	Mean	N														
Total bunker fuel	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***
Total diesel	118 [*]	6	136 [*]	6	279 [*]	5	217 [*]	5	212 [*]	5	262 [*]	5	250 [*]	3	268 [*]	6
Total fish oil	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***

6 Crew size

Participants provide the number of processing and non-processing crewmembers on board at any one time when the vessel was operating in the West Coast whiting fishery during the year (Table 6.1). In 2013, the EDC form was revised to also collect information on the total number of individuals employed annually (Table 6.2). The total number of individuals employed across all vessels serves as an upper bound of the total number of individuals employed in the fishery. Processing crew includes line workers, fishmeal crew, quality control, technicians, cleanup, factory managers, combis, and mechanics who work on processing equipment. Non-processing crew includes the captain, deckhands, wheelhouse, galley, and engineers.

Table 6.1: Average crew size. Average number of non-processing and processing crew positions per vessel (N = number of EDC vessels with non-zero, non-NA responses).

Crew Type	2009		2010		2011		2012		2013		2014		2015		2016	
	Mean	N														
Non-processing	35.2	6	33.0	6	34.0	5	32.2	5	31.2	5	45.4	5	27.7	3	25.0	6
Processing	90.3	6	85.2	6	66.0	5	71.8	5	68.6	5	83.0	5	80.0	3	77.7	6

Table 6.2: Average number of individuals employed. Average total number of individuals employed in non-processing and processing crew positions throughout the year (N = number of EDC vessels with non-zero, non-NA responses).

Crew Type	2009		2010		2011		2012		2013		2014		2015		2016	
	Mean	N	Mean	N	Mean	N	Mean	N								
Non-processing crew	—	—	—	—	—	—	—	—	34.4	5	53.0	5	30.3	3	34.0	6
Processing crew	—	—	—	—	—	—	—	—	85.8	5	113.0	5	89.0	3	94.8	6

7 West Coast and Alaska Round Weight

To document and track the volume of fish harvested and purchased during the year, participants are asked to provide the total round weight of all fish processed on the vessel in all fisheries, including the West Coast and Alaska. This information is then combined with the annual whiting fish purchases on the West Coast provided by the A-SHOP through the Pacific Fisheries Information Network (PacFIN) database (Table 7.1).

Table 7.1: Mothership sector allocation, West Coast whiting purchases, and total purchases. Final whiting allocation for the West Coast mothership whiting sector, total West Coast whiting purchases (excluding tribal purchases), and total weight of all purchases (West Coast, Alaska, and tribal) (thousands of metric tons) (N = number of vessels with non-zero, non-NA responses).

Description	2009	2010	2011	2012	2013	2014	2015	2016
	Total N							
WC whiting allocation	24	37.7	53	39.2	56.2	73	71.2	80.6
WC whiting purchases	24 6	42 6	53 5	38 5	52 5	61 5	27 3	65 6
WC + AK purchases	203 6	213 6	166 5	188 5	171 5	243 5	136 3	263 6

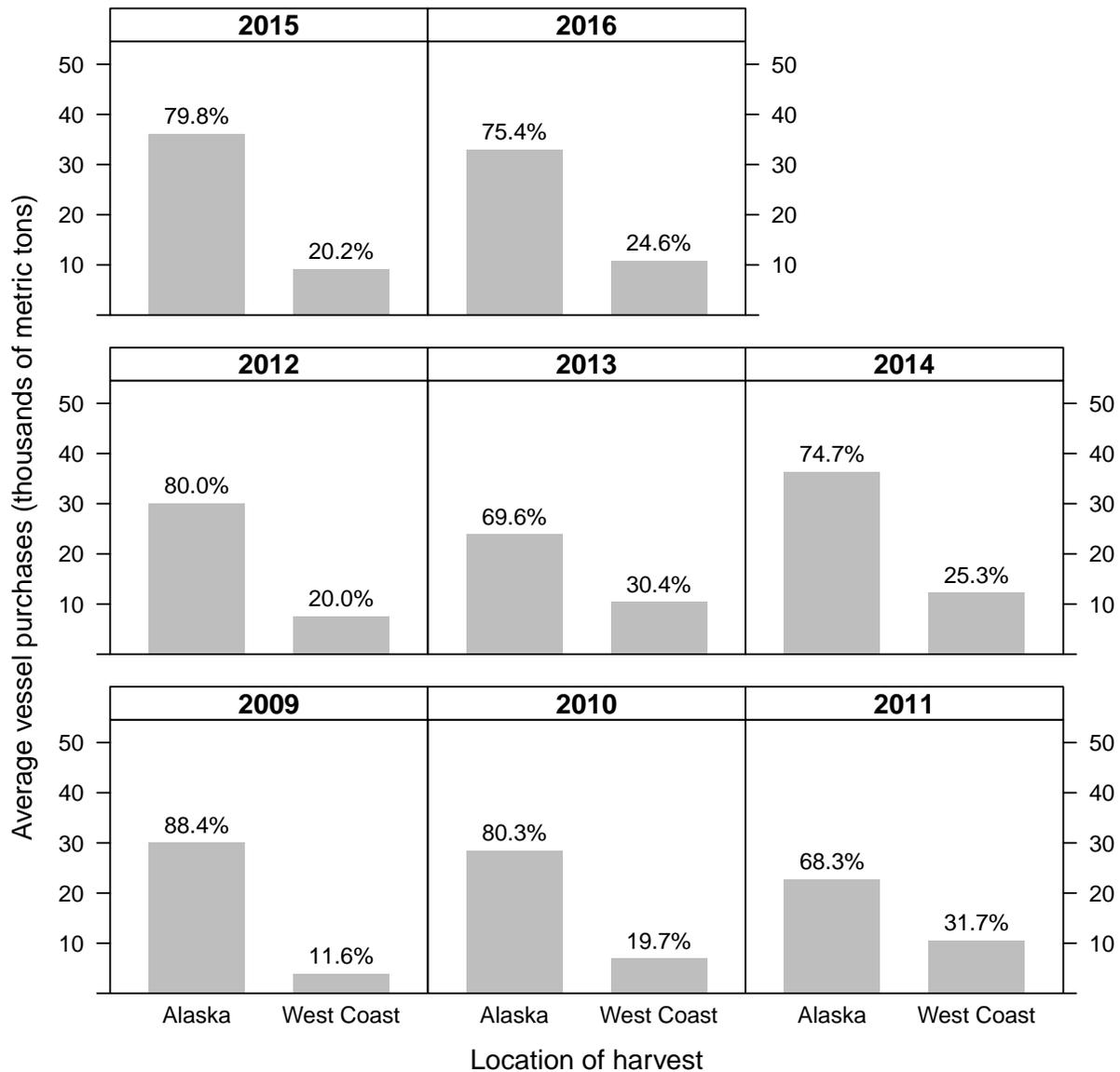


Figure 11: Average annual purchases on the West Coast and Alaska. Average annual purchases (thousands of metric tons) from 2009 to 2016 on the West Coast and in Alaska. Percentages above each bar indicate the portion of the total purchases in that fishery.

8 Revenue

Earnings sources on the EDC survey form include the total value received for processed product, sale or lease of mothership-endorsed permits, chartering, and insurance settlements, though participants have only reported fish production revenue to date. It is possible that vessels may have made end-of-season informal arrangements regarding leftover quota; however, the EDC survey does not capture this type of transfer.

Tables 8.1 and 8.2 summarize annual production in the mothership West Coast whiting sector. Participants provide total weight and value of production by major product categories. These values include any post-season adjustments for products produced during the survey year. Not included in the production value are any additional payments received to cover shipping, handling, or storage costs associated with the sale beyond the free-on-board (buyer assumes responsibility and liability for the product and pays shipping costs) port of discharge. The revenue only includes West Coast activities.

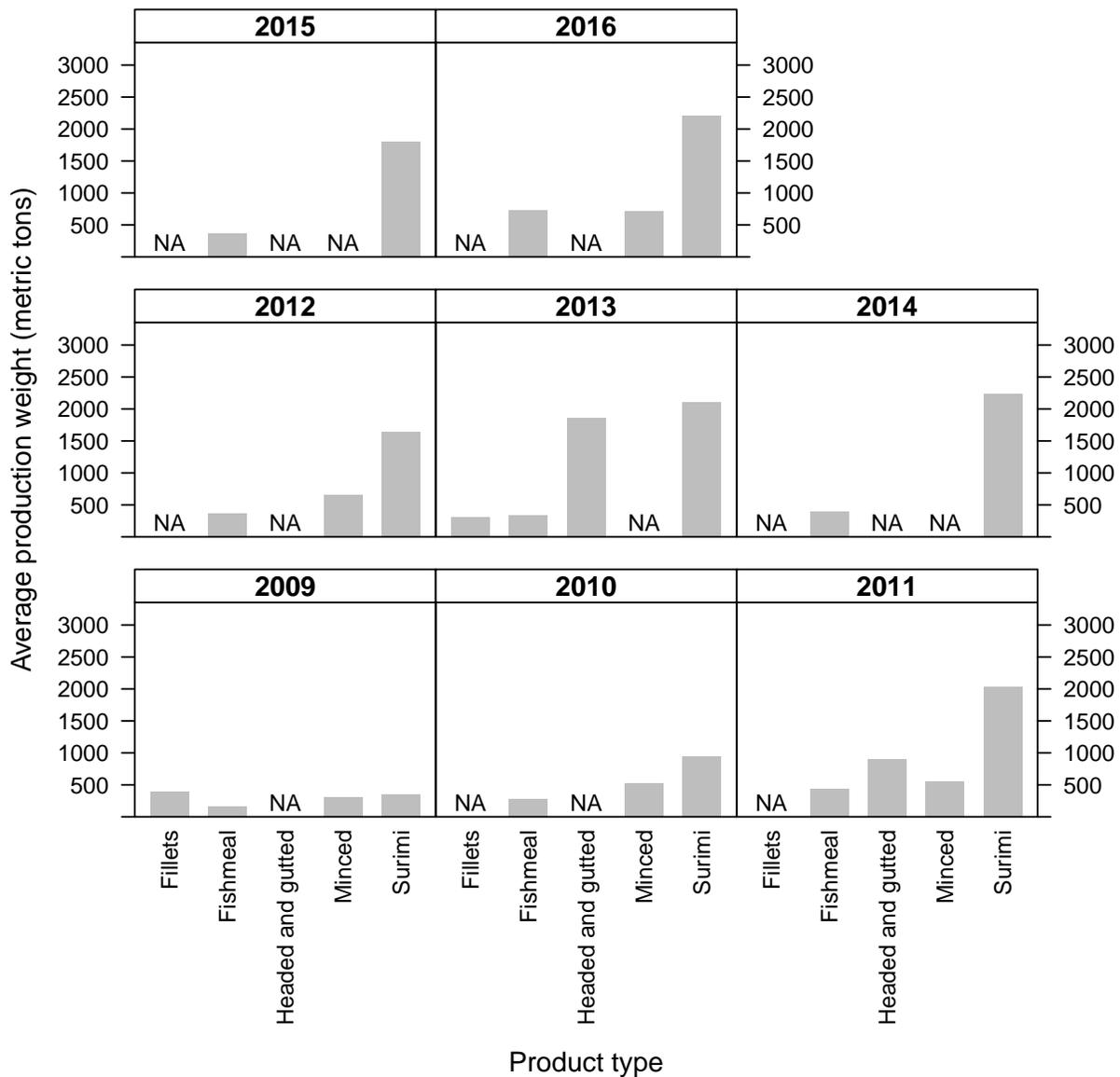


Figure 12: Whiting production weight by product type. Average whiting production weight (metric tons) by product type per vessel, excluding categories where no vessel reported production weight in any years. “NA” is shown where data are confidential and product categories where values were confidential or reported as zero for all vessels for all years are not included.

Table 8.1: Whiting production weight by product type. Average whiting production weight (metric tons) of Pacific whiting by product type per vessel (N = number of vessels with non-zero, non-NA responses).

	2009		2010		2011		2012		2013		2014		2015		2016	
	Mean	N														
Filletts	398 [*]	4	***	***	***	***	307 [†]	3	***	***	***	***	***	***	***	***
Fish oil	166 [†]	5	278 [*]	0	***	***	***	***	***	***	***	***	***	***	***	0
Fishmeal	***	***	***	5	437 [†]	4	344 [†]	4	390 [†]	5	369 [†]	3	737 [†]	4	***	***
Headed and gutted	***	***	***	***	902 [†]	3	1,860 [*]	3	***	***	***	***	***	***	***	***
Mincned	309 [*]	4	522 [†]	3	547 [†]	4	653 [†]	3	***	***	***	***	***	***	712 [*]	3
Roe	***	***	***	0	***	***	***	***	***	***	***	***	***	***	***	0
Round	***	***	***	0	***	***	***	***	***	***	***	***	***	***	***	***
Stomachs	***	***	***	0	***	***	***	***	***	***	***	***	***	***	***	***
Surimi	358 [†]	5	940 [†]	6	2,040 [†]	4	1,647 [†]	4	2,235 [†]	5	1,801 [*]	3	2,214 [†]	5	***	***
Other	***	***	***	0	***	***	***	***	***	***	***	***	***	***	***	0
Average total weight	1,528 [†]	6	1,883 [*]	6	3,552 [†]	5	3,739 [†]	5	5,212 [†]	5	4,002 [*]	5	2,803 [*]	3	3,164 [†]	6

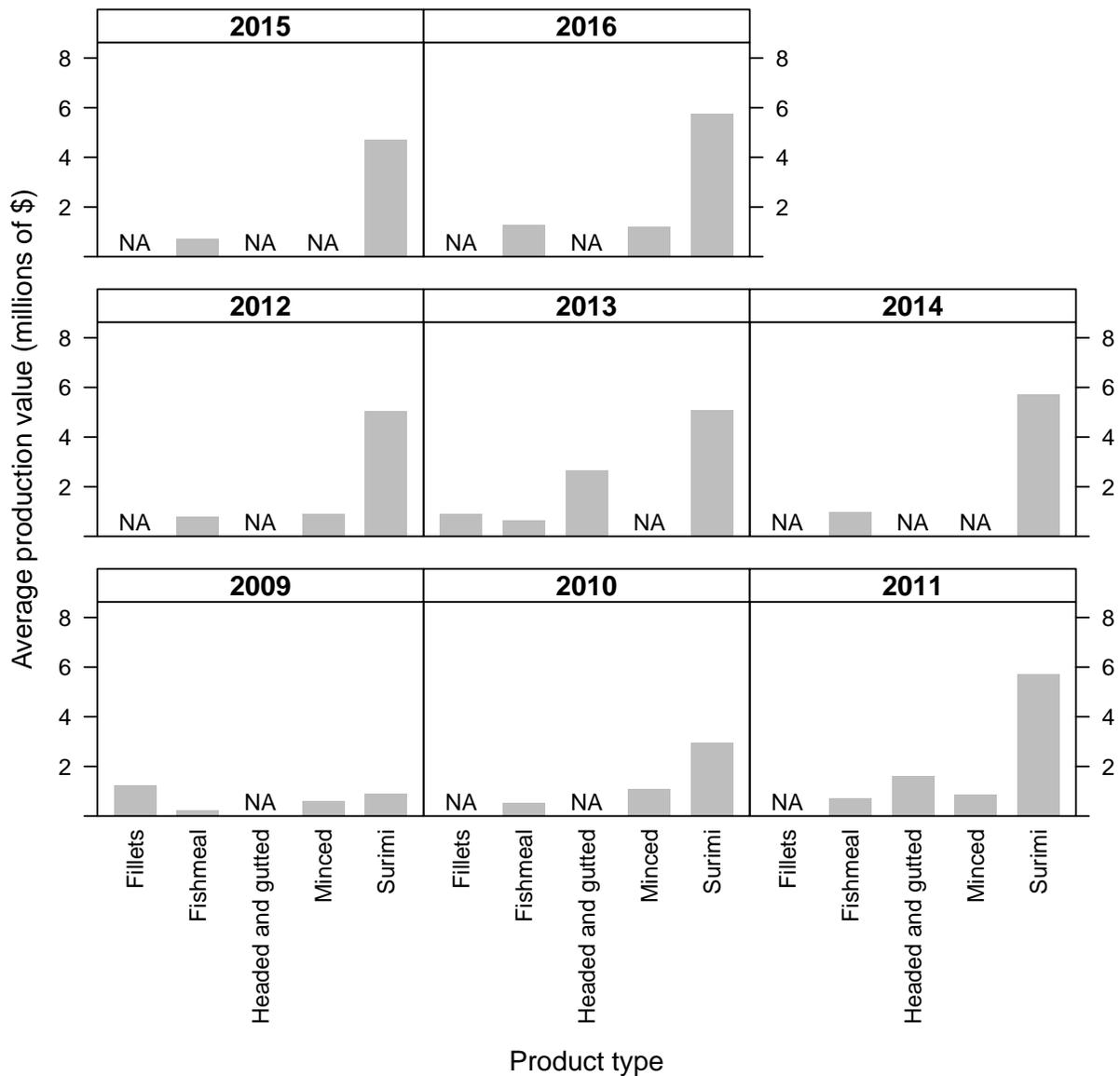


Figure 13: Whiting production value by product type. Average whiting production value (millions of \$) by product type per vessel, excluding categories where no vessel reported production values in any years. “NA” is shown where data are confidential and product categories where values were confidential or reported as zero for all vessels for all years are not included.

Table 8.2: Whiting production value by product type. Average whiting production value (millions of \$) by product type per vessel (N = number of vessels with non-zero, non-NA responses).

	2009		2010		2011		2012		2013		2014		2015		2016	
	Mean	N	Mean	N	Mean	N	Mean	N								
Filletts	\$1.24	4	***	***	***	***	***	***	***	\$0.90	3	***	***	***	***	***
Fish oil		0		0	***	***	***	***	***	***	***	***	***	***	***	0
Fishmeal	\$0.24	5	\$0.55	5	\$0.71	4	\$0.80	4	\$0.66	4	\$1.00	5	\$0.74	3	\$1.28	4
Headed and gutted	***	***	***	***	\$1.62	3	***	***	\$2.65	3	***	***	***	***	***	***
Minced	\$0.59	4	\$1.08	3	\$0.86	4	\$0.92	3	***	***	***	***	***	***	\$1.19	3
Roe		0		0		0		0	***	***		0		0		0
Round	***	***	0	0	***	***	***	***	***	***		0		0	***	***
Stomachs		0		0		0		0				0				0
Surimi	\$0.90	5	\$2.95	6	\$5.72	4	\$5.05	4	\$5.08	4	\$5.71	5	\$4.73	3	\$5.75	5
Other	***	***	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Average total value	\$3.01	6	\$4.74	6	\$7.73	5	\$6.05	5	\$7.11	5	\$9.28	5	\$6.76	3	\$7.18	6

9 Costs

This section describes the cost data that are collected by the EDC Program for the purpose of documenting variable costs, fixed costs, and total costs.

For EDC Program analyses, costs are divided into two categories: variable costs and fixed costs. Variable costs vary with the level of fishery participation, and generally include items such as fuel and crew compensation. Fixed costs do not vary as directly with the level of fishery participation, and generally include items such as vessel capital improvements. The designation of a cost as variable or fixed depends on many factors, including the relevant time horizon and use of the data. While some costs would clearly be considered fixed (e.g., the purchase of a new engine), others are more difficult to categorize. For the purposes of this report, the costs listed in Tables 9.1 and 9.2 to be variable and those costs listed in Tables 9.3, 9.4, 9.5, 10.1, and 10.2 to be fixed. The EDC Program will continue to refine the categorization of these costs.

Fishery participants provide both “capitalized expenditures” and “expenses” for vessel improvements and maintenance, fishing gear, and processing equipment because certain costs may be treated for tax accounting purposes as either capitalized or expensed. Capitalized expenditures are depreciated over a number of years whereas expensed items are fully deducted as a cost for the year in which they are incurred. In an effort to reduce the reporting burden and potential for errors, these data are collected as they are reported in the businesses’ accounting systems.

In order to conduct economic analyses of specific fisheries, it is important to have costs broken out by fishery (*i.e.*, West Coast whiting versus processing in Alaska). It may be feasible for participants to delineate costs at the fishery level for some items, but not for the majority of expenses. During the development of the EDC survey form, a key issue was the determination of which costs could reasonably be broken out by fishery. Each cost item is assigned to one or more categories based on how they are commonly tracked by industry members: 1) used in West Coast fisheries only (West Coast Only); 2) used on the West Coast and in other fisheries (Shared); and 3) used in all fisheries (All) regardless of whether they are used on the West Coast.

Finally, there are a variety of costs that are associated with operating a mothership that are not requested on the form because it is difficult to determine the share of the costs associated with the vessel. These costs include items that can be used for activities other than processing, or are too difficult to allocate to a particular vessel in a multi-vessel company. These expenses include office space, pickup trucks, storage of equipment, professional fees, and marketing. In general, the EDC survey attempts to capture costs that are directly related to vessel maintenance and processing operations, and not costs that are related to activities or equipment off the vessel. For these reasons, the aggregated costs presented here (variable costs, fixed costs, and total costs) underestimate the true costs of operating a business.

9.1 Variable costs

Where possible, data were collected for costs incurred while participating in only West Coast fisheries. Unlike fixed costs, variable costs are directly related to processing operations, and therefore can be more easily differentiated for activities on the West Coast versus other activities. Table 9.1 summarizes variable costs on the West Coast and Table 9.2 summarizes expenses on fish purchases.

Fish purchases

Participants submit information detailing the purchase of whiting and “Other” fish during the year, which is presented along with a calculation of the average annual price per metric ton in Table 9.2. The average price for the season is calculated using the total reported revenue divided by the total reported purchase weight for each vessel for that survey year.

9.2 Fixed costs

Costs on vessel and on-board equipment, fishing gear, and processing equipment

Table 9.3 presents average annual capitalized expenditures. Survey participants are asked to provide capitalized expenditures for the survey year associated with the following categories:

- New and used vessel and on-board equipment: excludes processing equipment and fishing gear, includes all electronics, safety equipment, and machinery not used to process fish. Participants are asked to provide information for **All** fisheries regardless of where the vessel fished.
- Processing Equipment: excludes all equipment, machines, and buildings based primarily on shore, excludes any processing equipment that is not used at least partially in the West Coast whiting fishery, and includes on-board freezers, storage equipment, packing equipment, conveyors, and on-board cargo handling equipment. Participants are asked to separately report costs related to processing equipment **Shared** between the West Coast and other fisheries from those costs related to equipment used only on the **West Coast**.
- Fishing gear: Includes nets, cables, doors, and fishing machinery used in the West Coast whiting fishery, excludes any fishing gear that is not used at least partially in the West Coast whiting fishery. Participants are asked to separately report costs related to fishing gear **Shared** between the West Coast and other fisheries from those costs related to gear used only on the **West Coast**.

Participants are asked to separate capitalized expenditures and expenses on fishing gear and processing equipment used on the West Coast versus those expenses that are shared.

9.3 Quota and permit costs

Participants submit information on quota and permit expenses. No vessels reported lease or purchase of permits; however, vessels may have made end-of-season informal arrangements regarding leftover quota. The EDC survey does not capture this type of transfer.

Table 9.1: Variable expenses. Average variable expenses on the West Coast for motherships (thousands of \$) (N = number of vessels with non-zero, non-NA responses).

Expense Category	2009		2010		2011		2012		2013		2014		2015		2016	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
Additives	29.8	5	148.9	6	392.3	4	245.1	4	363.0	4	384.8	5	347.5	5	314.4	5
Cargo/product insurance	12.3	5	11.7	5	***	***	135.7	5	146.5	4	176.0	5	194.3	5	127.3	5
Communication	5.8	6	4.3	6	15.7	5	8.9	5	11.7	4	15.0	4	13.0	3	10.9	6
Food	47.0	5	48.0	6	127.5	5	136.3	5	107.7	5	148.1	5	154.5	5	140.2	6
Freight	***	***	***	***	***	***	38.1	3	21.9	5	24.3	4	***	***	9.7	3
Fuel and lubrication	262.0	6	389.8	6	1,051.9	5	749.8	5	787.8	5	1,019.4	5	660.5	5	605.3	6
Non-processing crew	326.0	6	411.3	6	651.6	5	492.6	5	657.1	5	812.5	5	754.4	5	739.3	6
Observers	15.7	6	17.0	6	36.7	5	32.9	5	29.1	5	37.5	5	32.2	5	47.4	5
Offloading	33.6	6	30.7	6	55.2	5	29.2	5	70.7	4	89.3	5	***	***	66.8	4
Packing materials	86.6	6	97.4	6	228.9	5	132.7	5	152.3	5	229.3	5	160.4	5	256.2	5
Processing crew	375.7	6	534.5	6	842.7	5	725.9	5	736.3	5	954.6	5	898.3	5	973.4	6
Supplies	***	***	40.5	4	47.2	3	70.4	3	118.2	3	42.8	3	28.7	3	36.0	6
Travel	18.2	4	14.5	4	33.4	4	39.2	4	***	***	***	***	31.9	3	64.9	4
Pacific whiting purchases	658.4	6	1,237.4	6	2,296.5	5	1,845.6	5	2,255.6	5	2,640.1	5	1,749.3	5	1,905.0	6
Non-whiting fish purchases		0		0		0		0		0		0		0		0
Average total variable costs	1,864.8	6	2,973.0	6	5,811.7	5	4,582.3	5	5,324.6	5	6,581.4	5	5,112.3	5	5,123.9	6

Table 9.2: Fish purchased and received. Average purchase weight (thousands of mt), purchase cost (thousands of \$), purchase price (thousands of \$/mt), and weight received but not paid for (thousands of mt) (N = number of vessels with non-zero, non-NA responses).

	2009		2010		2011		2012		2013		2014		2015		2016	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
Whiting purchase weight	3.9	6	6.0	6	10.0	5	7.5	5	10.4	5	12.3	5	9.2	3	10.8	6
Whiting purchase cost	658.4	6	1,237.4	6	2,296.5	5	1,845.6	5	2,255.6	5	2,640.1	5	1,749.3	3	1,905.0	6
Whiting purchase price	0.2	6	0.2	6	0.2	5	0.2	5	0.2	5	0.2	5	0.2	3	0.2	6
Other fish purchase weight	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other fish purchase cost	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Whiting received but not paid for	0.1	4	***	***	***	***	***	***	***	***	***	***	***	***	***	***
Other fish received but not paid for	***	***	***	***	0	0	***	***	***	***	0	0	***	***	***	***

Table 9.3: Capitalized expenditures on gear and equipment. Average capitalized expenditures (thousands of \$) on vessel and on-board equipment, fishing gear, and processing equipment (N = number of EDC vessels with non-zero, non-NA responses). Note that some expenditures were requested for (a) all fisheries the vessel participates in regardless of where the vessel fished (denoted by "All"), (b) West Coast whiting, Alaska, and other (denoted by "Shared"), and (c) for West Coast fisheries only (Washington, Oregon, and California, denoted by "WC").

Expenditure category	2009		2010		2011		2012		2013		2014		2015		2016	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
Fishing gear (Shared)	\$171:	5	***	***	\$576:	5	\$272:	4	\$238:	4	\$124:	4	\$326:	5	***	***
Fishing gear (WC)	***	***	***	***	0	0	0	0	0	0	***	***	0	0	***	***
Processing equipment (Shared)	\$1,983:	5	\$932:	5	***	***	\$608:	5	\$821:	4	\$540:	6	\$569:	6	\$569:	7
Processing equipment (WC)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vessel and on-board equipment (All)	\$1,636:	5	\$1,601:	6	\$760:	7	\$2,240:	7	\$2,723:	6	\$3,028:	5	\$2,134:	5	\$2,015:	6
Average total cap. expenditures	\$3,161:	6	\$2,716:	6	\$1,372:	7	\$2,829:	7	\$3,429:	6	\$3,165:	6	\$2,618:	6	\$2,399:	7

Table 9.4: Expenses on gear and equipment. Average expenses (thousands of \$) on repair or maintenance of fishing gear, processing equipment, or other vessel and on-board equipment (N = number of vessels with non-zero, non-NA responses). Note that some expenditures were requested for (a) all fisheries the vessel participates in regardless of where the vessel fished (denoted by "All"), (b) West Coast whiting, Alaska, and other (denoted by "Shared"), and (c) for West Coast fisheries only (Washington, Oregon, and California, denoted by "WC").

Expense category	2009		2010		2011		2012		2013		2014		2015		2016	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
Fishing gear (Shared)	286:	4	***	***	189:	7	241:	7	251:	5	233:	5	243:	5	203:	6
Fishing gear (WC)	***	***	***	***	***	***	0	0	0	0	0	0	0	0	***	***
Processing equipment (Shared)	400:	4	357:	5	248:	7	605:	7	579:	5	512:	5	532:	6	582:	7
Vessel and on-board equipment (All)	1,546:	6	1,335:	6	1,049:	7	1,260:	6	1,458:	6	1,661:	6	2,005:	6	1,455:	7
Average total expenses	2,025:	6	1,841:	6	1,508:	7	1,927:	7	2,150:	6	2,282:	6	2,740:	6	2,215:	7

Other fixed costs

Participants also provide information about other fixed costs and vessel depreciation, which is summarized in Tables 9.5 and 9.6.

Table 9.5: Other fixed expenses. Average fixed costs (thousands of \$) on all other categories (N = number of vessels with non-zero, non-NA responses).

Cost	2009		2010		2011		2012		2013		2014		2015		2016	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
Co-op fees	0	0	0	0	***	***	***	***	0	0	***	***	0	0	***	***
Insurance	1,126	6	1,179	6	884	7	693	7	395	6	710	6	758	6	669	7
Lease of vessel	***	***	0	0	***	***	***	***	***	***	***	***	***	***	***	***
Moorage	361	6	358	6	305	7	318	7	325	6	361	6	399	6	373	7
Average total	1,657	6	1,537	6	1,194	7	1,016	7	723	6	1,077	6	1,160	6	1,049	7

Table 9.6: Depreciation. Average depreciation (millions of \$) taken during the survey year (N = number of vessels with non-zero, non-NA responses).

	2009		2010		2011		2012		2013		2014		2015		2016	
	Mean	N														
Depreciation	2.14	6	2.48	6	2.18	7	2.43	7	1.67	6	2.30	6	2.34	6	2.90	7

Mothership Data Analysis

To fully evaluate cost information and calculate net revenue for specific fisheries, NWFSC economists must do more than summarize data submitted by fishery participants. This section describes the methods used to calculate costs and net revenue for only West Coast fisheries.

10 Cost Disaggregation

This section describes the methods used to calculate costs and net revenue for participating in only West Coast fisheries. Some cost categories on the EDC forms are only incurred while participating in West Coast fisheries, while others include costs incurred while operating in Alaska. For some costs, it may be feasible for participants to break out or track costs at the fishery level. However, for some costs this is not possible. Therefore, cost disaggregation is required to estimate total costs and total cost net revenue on the West Coast. As part of the EDC development process, NWFSC staff met with participants to determine which cost categories could be reported for only West Coast fisheries and which could not, and therefore require further disaggregation. Each cost item is assigned to one or more categories based on how it is commonly tracked by industry members: 1) used on West Coast fisheries only (West Coast Only); 2) used on the West Coast and in other fisheries (Shared); and 3) used in all fisheries (All) regardless of whether they are used on the West Coast.

To disaggregate the West Coast and Alaska costs, we allocate costs proportional to the weight of fish purchased. We calculate the ratio of total West Coast Pacific whiting weight (for all years the vessel supplied data) to the weight in all fisheries for the same time span:

$$\frac{\sum_y WT_n^{WestCoastMothership}}{\sum_y WT_n^{AllFisheries}}$$

where n is an individual vessel in a season, summed over all years, y , that the vessel has supplied EDC data. Thus, each vessel's ratio of costs being allocated to the West Coast is the same for all years. This

method makes the proportion of costs allocated to the West Coast less sensitive to fluctuations in the TAC for the West Coast Pacific whiting and Alaska fisheries.

For vessels that participated in the tribal sector of the West Coast Pacific whiting fishery, West Coast costs, days at sea, fuel use, and production weight and value have been adjusted to reflect only non-tribal mothership sector activities as needed using a ratio of mothership pounds to all West Coast pounds.

10.1 West Coast portion of fixed costs

Based on the methods described above, information submitted by participants about fixed costs are disaggregated into West Coast-only values and presented in Tables 10.1 and 10.2.

Table 10.1: West Coast portion of fixed costs on gear and equipment. Capitalized expenditures and expenses (thousands of \$) on vessel and on-board equipment, fishing gear, and processing equipment on the West Coast (N = number of vessels with non-zero, non-NA responses).

Cost	2009		2010		2011		2012		2013		2014		2015		2016	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
Fishing gear	89:	5	***	142:	7	76:	7	51:	6	89:	5	149:	4	77:	6	
Processing equipment	256:	6	343:	6	92:	7	195:	7	236:	6	184:	6	248:	5	226:	7
Vessel and on-board equipment	357:	6	501:	6	334:	7	862:	7	832:	6	1,223:	6	1,106:	5	455:	7
Average total	688:	6	966:	6	568:	7	1,134:	7	1,120:	6	1,481:	6	1,472:	5	747:	7

Table 10.2: West Coast costs on insurance, moorage, fees, and leasing. Expenses on insurance, moorage, fees, and leasing on the West Coast (thousands of \$) (N = number of vessels with non-zero, non-NA responses).

Cost	2009		2010		2011		2012		2013		2014		2015		2016	
	Mean	N														
Co-op fees	0	0	***	***	***	***	***	***	0	***	***	***	0	***	***	***
Insurance	162:	6	196:	6	142:	7	131:	7	86:	6	177:	6	203:	5	154:	7
Lease of vessel	***	***	0	***	***	***	***	***	***	***	***	***	***	***	***	***
Moorage	57:	6	58:	6	51:	7	56:	7	75:	6	66:	6	78:	5	59:	7
Average total	258:	6	253:	6	196:	7	190:	7	163:	6	246:	6	283:	5	219:	7

10.2 Summary of West Coast portion of costs

Table 10.3: Summary of West Coast portion of costs. Average capitalized expenditures and expenses (thousands of \$) on vessel and on-board equipment, fishing gear, and processing equipment, other fixed costs, and all variable costs on the West Coast (N = number of EDC vessels with non-zero, non-NA responses).

Cost	2009		2010		2011		2012		2013		2014		2015		2016	
	Mean	N														
Total costs on vessel and on-board equipment, fishing gear, and processing equipment	\$688	6	\$966	6	\$568	7	\$1,134	7	\$1,120	6	\$1,481	6	\$1,472	5	\$747	7
Total other fixed costs	\$258	6	\$253	6	\$196	7	\$190	7	\$163	6	\$246	6	\$283	5	\$219	7
Total variable costs	\$1,865	6	\$2,973	6	\$5,812	5	\$4,582	5	\$5,325	5	\$6,581	5	\$5,112	3	\$5,124	6
Average total	\$2,811	6	\$4,192	6	\$4,915	7	\$4,597	7	\$5,721	6	\$7,212	6	\$4,823	5	\$5,358	7

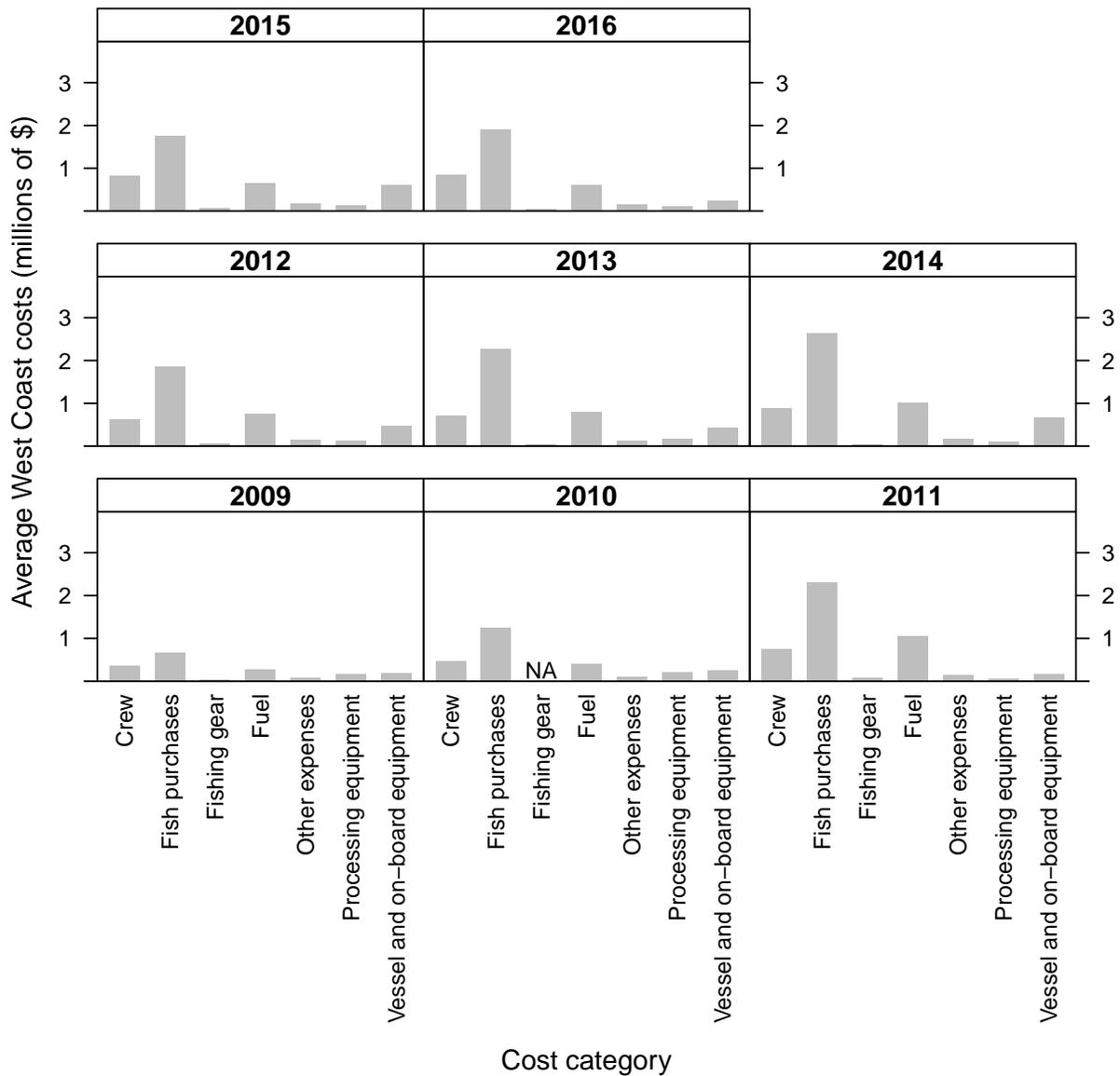


Figure 14: Average costs by category on the West Coast. Average costs by category on the West Coast including capitalized expenditures and annual expenses (millions of \$). Crew includes both processing and non-processing crew expenses. The “Other” category includes expenses on additives, communication, fees, insurance, freight, moorage, observers, offloading, supplies, packing, travel, and Sea-State monitoring. “NA” is shown where data are confidential.

11 Net Economic Benefits

The level of net benefits generated by fishery participants indicates whether an operation is a viable ongoing business, but there are numerous ways to calculate and assess net benefits depending on the data available, including *economic profit*¹ and *net revenue*. Economic profit is an indicator of the long-term viability of fishery operations since it encapsulates all costs, including the opportunity cost of non-cash inputs, and can be used to estimate whether there are incentives or disincentives to invest in capital or enter and leave the fishery. However, calculations of economic profit are beyond the scope of these reports because the EDC Program does not collect information on opportunity costs.

The EDC Program calculates a monetary, financial measure of a participant's net cash flow by subtracting monetary costs from gross revenue, which we call net revenue. The only costs that are included are those that are actually paid or associated with a financial transaction. Net revenue therefore measures the annual financial well-being of a participant's operation and can be used to assess how changes in fishery management may affect monetary gains or losses.

11.1 Net revenue

Net revenue is calculated two ways: using only variable costs, and using variable costs plus fixed costs (total costs).² The first calculation is called variable cost net revenue, while the second is called total cost net revenue (Figure 15). Variable cost net revenue is useful for examining changes in fishery operations that likely do not affect fixed costs. For example, the cost of processing an additional metric ton of fish is most representative of the true costs when only variable costs are considered. Total cost net revenue is generally a better measure of financial gain or loss for an entire year, season, or fishery.

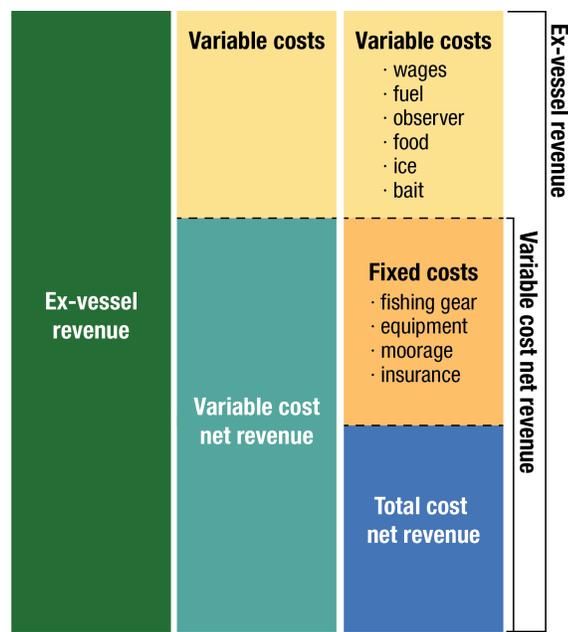


Figure 15: Composition and derivation of variable and total cost net revenue used in the EDC Program analysis of revenue, costs, and economic performance.

There are two caveats associated with the net revenue calculations in this report. First, as noted in Section 4, there are certain costs associated with operating a vessel that are not requested on the EDC

¹ Whitmarsh D., James C., Pickering H., Neiland A. 2000. The profitability of marine commercial fisheries: a review of economic information needs with particular reference to the UK. *Marine Policy*, Vol. 24(3), pp. 257-263.

² See Section 9 for a more complete discussion of variable and fixed costs used in this report.

form either because it is difficult to determine the share of the cost associated with the vessel, because costs pertain to items used for activities other than catching or processing fish, or are too difficult to allocate to a particular vessel in a multi-vessel company. These costs include office space, vehicles and transport trucks, storage of equipment, professional fees, and income taxes. Therefore, the net revenue presented here is likely an overestimate of true net revenue.

Second, the EDC forms do not collect information about financing costs of large purchases and investments. Instead of using principal and interest payment information in calculations of net revenue, we therefore must use the total costs associated with the purchases, repair, maintenance, or improvements. For example, if a new engine is purchased, the total cost of the engine is used in the year that it was reported even though the actual cash outlay, if it were financed, would only be the principal and interest payments. It is likely that many larger capital costs, and perhaps some operating costs, are financed. This would mean that the actual cash outlays in a particular year for those items would be less than what is used in the EDC net revenue calculation. This may largely balance out over time because previously financed capital is also not included. Moreover, total cost net revenue is expected to be representative of actual total cost net revenue only when averaged over many years and across participants because relatively large capital costs only occur periodically.

Net revenue for all West Coast activities

Average net revenue is calculated for all activities on the West Coast. West Coast revenue only includes revenue from production of fish. The variable and fixed costs do not include costs related to acquiring limited entry permits, quota shares, or quota pounds.

$$\text{Variable cost net revenue} = \text{West Coast revenue} - \text{West Coast variable costs}$$

$$\text{Total cost net revenue} = \text{West Coast revenue} - (\text{West Coast variable costs} + \text{West Coast fixed costs})$$

Table 11.1: West Coast variable cost and total cost net revenue. Average total revenue, variable costs, variable cost net revenue, fixed costs, and total cost net revenue on the West Coast (millions of \$) (N = number of EDC vessels with non-zero, non-NA responses).

	2009		2010		2011		2012		2013		2014		2015		2016	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
Revenue	\$3.01	6	\$4.74	6	\$7.73	5	\$6.05	5	\$7.12	5	\$9.28	5	\$6.76	3	\$7.18	6
(Variable costs)	\$1.86	6	\$2.97	6	\$5.81	5	\$4.58	5	\$5.32	5	\$6.58	5	\$5.11	3	\$5.12	6
Variable cost net revenue	\$1.14	6	\$1.76	6	\$1.91	5	\$1.47	5	\$1.79	5	\$2.70	5	\$1.64	3	\$2.05	6
(Fixed costs)	\$0.95	6	\$1.22	6	\$0.96	5	\$1.72	5	\$1.46	5	\$2.04	5	\$2.60	3	\$1.09	6
Total cost net revenue	\$0.20	6	\$0.55	6	\$0.96	5	-\$0.25	5	\$0.33	5	\$0.66	5	-\$0.96	3	\$0.96	6

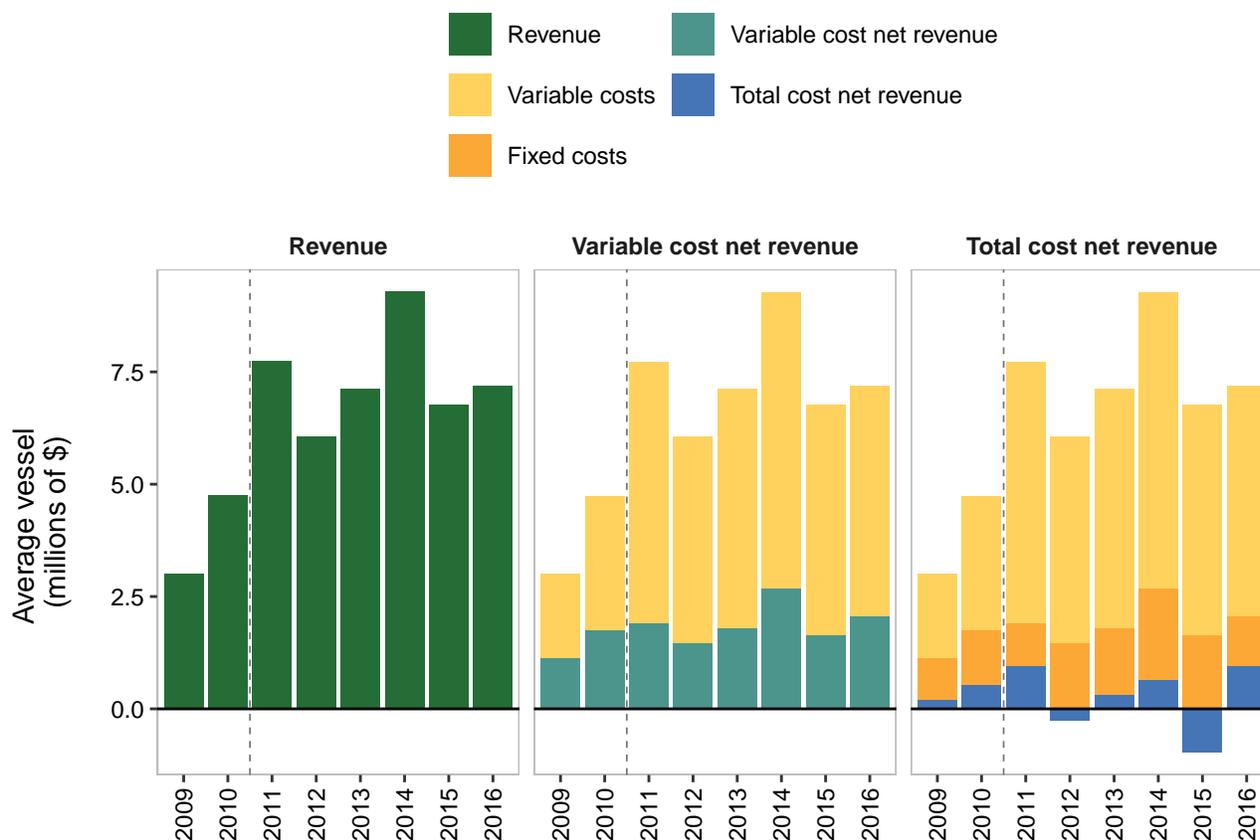


Figure 16: Average total reported revenue (left), average variable cost net revenue (revenue minus variable costs) (middle), and average total cost net revenue (revenue minus variable costs and fixed costs) (right) (millions of \$). Dashed line represents the beginning of the catch share program.

12 Economic Performance: Cost, Revenue, Net Revenue, Markup, and Product Recovery Rates

Net revenue rates

Tables 12.1, 12.2, and 12.3 provide revenue, variable costs, variable cost net revenue, fixed costs, and total cost net revenue by days at sea (West Coast processing and steaming), metric ton of fish produced, and metric ton of fish purchased. Rates are calculated as vessel averages and thus reflect the operations of the average vessel and not the fleet as a whole.

Table 12.1: Revenue, costs, and net revenue per day. Mean revenue, variable costs, fixed costs, variable cost net revenue, and total cost net revenue per day (\$).

Per day	2009		2010		2011		2012		2013		2014		2015		2016	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
Revenue	\$152,259	6	\$150,571	6	\$110,030	5	\$116,599	5	\$127,419	5	\$153,776	5	\$121,937	3	\$91,050	6
(Variable costs)	\$93,860	6	\$93,416	6	\$86,425	5	\$93,125	5	\$93,008	5	\$113,831	5	\$91,612	3	\$66,354	6
Variable cost net revenue	\$58,400	6	\$57,155	6	\$23,606	5	\$23,474	5	\$34,411	5	\$39,945	5	\$30,325	3	\$24,696	6
(Fixed costs)	\$47,935	6	\$38,942	6	\$15,121	5	\$34,037	5	\$27,438	5	\$31,210	5	\$48,591	3	\$18,028	6
Total cost net revenue	\$10,465	6	\$18,213	6	\$8,485	5	-\$10,563	5	\$6,973	5	\$8,734	5	-\$18,267	3	\$6,668	6

Table 12.2: Revenue, costs, and net revenue per metric ton produced. Mean revenue, variable costs, variable cost net revenue, fixed costs, and total cost net revenue per metric ton produced (\$).

Per mt produced	2009		2010		2011		2012		2013		2014		2015		2016	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
Revenue	\$2,160	6	\$2,647	6	\$2,000	5	\$1,715	5	\$1,588	5	\$2,267	5	\$2,440	3	\$1,977	6
(Variable costs)	\$1,314	6	\$1,639	6	\$1,588	5	\$1,655	5	\$1,199	5	\$1,668	5	\$1,819	3	\$1,517	6
Variable cost net revenue	\$847	6	\$1,008	6	\$412	5	\$60	5	\$390	5	\$599	5	\$620	3	\$460	6
(Fixed costs)	\$752	6	\$689	6	\$280	5	\$844	5	\$357	5	\$462	5	\$960	3	\$577	6
Total cost net revenue	\$95	6	\$319	6	\$132	5	-\$785	5	\$33	5	\$138	5	-\$340	3	-\$118	6

Table 12.3: Net revenue per metric ton purchased. Mean revenue, variable costs, variable cost net revenue, fixed costs, and total cost net revenue per metric ton purchased (\$).

Per mt purchased	2009		2010		2011		2012		2013		2014		2015		2016	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
Variable cost net revenue	\$307	6	\$276	6	\$133	5	-\$44	5	\$158	5	\$196	5	\$204	3	\$128	6
Total cost net revenue	\$42	6	\$82	6	\$35	5	-\$495	5	\$5	5	\$47	5	-\$64	3	-\$98	6

Markup and product recovery rates

The product markup for the mothership whiting sector represents the difference between the final processed product value and the cost of fish purchased from vessels, calculated using the formula

$$\frac{\sum_{n=1}^N R_n}{\sum_{n=1}^N C_n}$$

where N is the number of motherships that processed on the West Coast, R is the value of production for each mothership vessel, and C is the cost of fish purchases by each mothership vessel. The average markup is calculated for each survey year (Table 12.4).

Table 12.4: Markup rate. The markup rate (total value of production divided by total cost of fish purchases) for motherships on the West Coast (N = number of vessels with non-zero, non-NA responses).

	2009		2010		2011		2012		2013		2014		2015		2016	
	Mean	N														
Markup	4.57	6	3.83	6	3.36	5	3.28	5	3.15	5	3.51	5	3.86	3	3.77	6

The product recovery rate for the mothership whiting sector (Table 12.5) is calculated as

$$\frac{\sum_{n=1}^N WT_n^{fishoutputs}}{\sum_{n=1}^N WT_n^{fishinputs}}$$

where N is the number of motherships that purchased fish on the West Coast, $WT_n^{fishoutputs}$ is the weight of fish produced by each mothership vessel, and $WT_n^{fishinputs}$ is the weight of fish purchases from catcher vessels by each mothership vessel. The average product recovery rate is calculated for each survey year (Table 12.5).

Table 12.5: Product recovery rate. The product recovery rate (total weight of production divided by total weight of fish purchases) for motherships on the West Coast (N = number of vessels with non-zero, non-NA responses).

	2009		2010		2011		2012		2013		2014		2015		2016	
	Mean	N														
Product recovery rate	0.39	6	0.27	6	0.34	5	0.50	5	0.50	5	0.33	5	0.31	3	0.29	6